THE
ELECTRICAL REVIEW

Volume CXXIX — No. 3337

Friday, November 7, 1941

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EDITORIAL, ADVERTISING AND PUBLISHING OFFICES: Dorset House, Stamford Street, London, S.E.1

Telegraphic Address: "Ageekay, Sedist, London." Code: A B C. Telephone No.: Waterloo 3333 (35 lines)
Registered at G.P.O. as a Newspaper and Canadian Magazine rate of postage. Entered as Second Class Matter at the New York, U.S.A., Post Office.

Subscription Rates, Postage free: United Kingdom, £1 14s. 8d.; Canada, £1 12s. 6d.; Colonial and Foreign, £1 14s. 8d. per annum.

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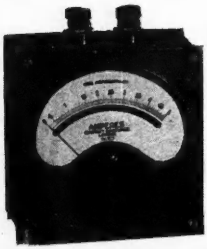

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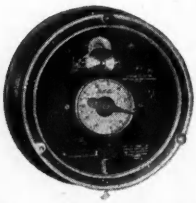

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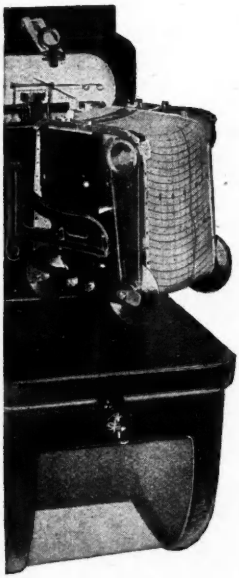

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Vol. CXXIX. No. 3337. NOVEMBER 7, 1941 6d. WEEKLY

Fuel Economy

Where Does Electricity Stand?

THE Select Committee on National Expenditure roams in a wider field than its title seems to indicate. Its latest report, the twenty-fourth of the present session, deals very largely with the subject of economy in the use of fuels.

This is a matter which we realise to be of first-rate importance since the supply of coal, for reasons which we need not repeat, has tended to fall short of demand. We have backed the steps taken by the Electrical Development Association to secure the fullest possible use of the least possible amount of electricity in the people's homes, recognising the necessity of sacrificing sectional interests to the general well-being of the country.

That is not to say that we have had no qualms. We were not entirely happy when the establishment of the Joint Gas & Electricity Committee was tardily announced for we felt that advantage, if any, could accrue only to the gas industry, and the gas interests seemed rather preponderant. A "truce" to competition was called—rather unnecessarily perhaps, for circumstances did not encourage the continuance of peacetime rivalry.

Looking at the recommendations made by the Select Committee, we still feel uneasy. We agree with much that the Committee says: for instance it backs our contention that a compulsory rationing scheme for gas and electricity if not utterly impracticable would be extremely difficult to operate. We also think that a greater use of the B.B.C. to urge voluntary economy is a good thing and maybe a slight curtailment of programmes would do no harm and save electricity. In this connection the appointment of the chairman of the Joint Gas and Electricity Committee to advise the B.B.C. is significant.

But the Committee goes on to suggest that stress should be laid upon the necessity for electricity consumption to be cut down during the morning on the grounds that this is the period in which the demands of industry are greatest. Even that we cannot object to, but surely industry's demands for gas also occur then, so why particularly stress electrical economy?

Later on the importance of the gas industry as a producer of valuable by-products is emphasised, indicating a need for the production of more and more gas. To avoid the waste of gas in the manufacture of these by-products the Committee suggests that a fuller use of gas for domestic purposes "might well justify encouragement." If this means anything at all it visualises the displacement of coal and electricity by gas in the domestic sphere; just to use more gas would go against the economy recommendations earlier in the report.

As the supply of coal to gasworks is only about sufficient for the present rate of production it may be presumed that coal would be diverted from electric power stations, if it were of a suitable type. There is another point: a great deal of the coal burned in power stations is quite unsuitable for gas production—or for anything else—

and its consumption by the electricity supply industry is surely a real economy. At the risk of being accused of petty partisan argument we must register a protest at any proposal to take the domestic load from the electricity supply industry during the war, leaving it when peace is declared with a vast amount of surplus plant and no load to employ it. Unless, indeed, this is a step towards the "rationalisation" of the fuel industries of which we are beginning to hear a great deal (mostly from non-electrical people) we cannot understand the anxiety to oust electricity from the home.

Domestic Supplies

STANDING components of two-part tariffs have been conveniently related to the lighting load. Helped out by diversity this practice has proved satisfactory, except during cold snaps, when present methods of employing electric heating have sometimes upset the economic balance of costs and revenue. Nevertheless, caution is necessary when applying accepted methods to all-electric houses of the middle-class type, which may require 10,000 kWh or so per annum, as Mr. P. Schiller points out in this issue. That is not to countenance any slackening of effort to secure the load, as soon as the way is clear to do so, but rather to emphasize the need especially with high coal prices, to exert the imagination to devise means by which costs of supply may be balanced against what the consumer can afford to pay for the service.

Meeting the Load

EFFECTIVE power-station capacity may sometimes be increased without the installation of complete generating units. Thus the Commonwealth Edison Co. has, the *Electrical World* states, added 30,000 kW at its Crawford station recently as a result of improved boiler performance due to new arrangements for a supply of washed coal. At its Northwest station, the company has provided a further 62,000 kW by putting in three high-pressure boilers which have enabled certain turbo-alternators to be restored to service. Presumably interconnection with other stations had enabled these sets to be dispensed with temporarily on grounds of economy, and their recommissioning at need illustrates the value of the flexibility introduced by a co-operative system of operation.

Capacitors

COMPETITION between static and rotary condensers begins after an optimum value of the former has been installed in distribution feeders. On this assumption is based a study with the aid of monograms which appears in the *General Electric Review*. This deals with the widely varying conditions under which each type is economically more suitable for inclusion in the transmission system for voltage regulation. The general conclusion is that in the United States capacitors should hold the field (provided no lagging current is needed for correction) up to 5,000 kVA and even up to 15,000 kVA where energy is supplied at more than stated figures. There is another aspect that we believe should have weight, *i.e.* static plant is in principle preferable to rotating plant.

Accident Prevention

ONLY one reference is made to electricity in the annual report for 1940 of the Chief Inspector of Factories. That is the statement that "Electrical Accidents" is not to be published again this year. From one angle this should be gratifying, implying a negligible proportion of the increased number of industrial accidents to be attributable to electricity. On the other hand, the practical suggestions for the prevention of mishaps offered by the Senior Electrical Inspector, Mr. H. W. Swann, in this (formerly) annual small publication should be more useful than ever now, when so many employees are new to workshop conditions.

The Venner Case

SENSATIONAL statements appeared in the daily papers last week in connection with a claim for compensation for injuries made at Croydon County Court by an employee of Venner Time Switches, Ltd. It was alleged that there was a great deal of horseplay during working hours whereby much time was lost. The Shop Stewards' Committee of the works subsequently issued a statement in which it was pointed out that the alleged incidents occurred only in one shop at a time when there was insufficient work to keep the workers there fully employed. As the result of suggestions for increasing output made by the factory workers such conditions did not now prevail and the output was higher in September than in any previous month.

Overcoming Raid Damage

Lessons Learnt by Supply Undertakings

A story of courage and resource in some of the badly-raided areas of the country

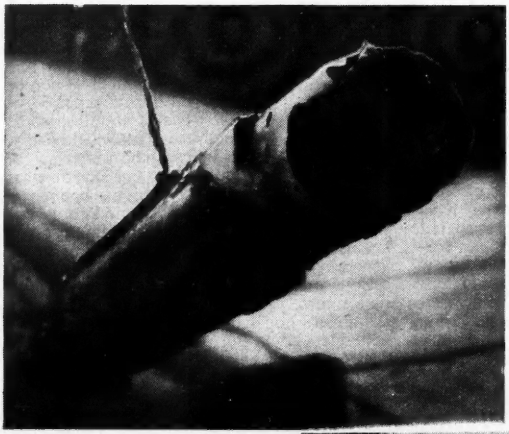
THE recent lull in hostile activity over this country has given electricity supply authorities an opportunity to take stock of troubles and difficulties which they are likely to have to face again when the anticipated bombing re-starts and also to perfect their arrangements for meeting any eventuality. Some undertakings may have been lucky enough so far to have been spared the attention of the enemy. Others less fortunate may like to know how their fellow undertakings have been faring and the steps they have been taking to minimise the dislocation of supplies. The problems confronting individual undertakings do, of course, vary considerably from district to district, but the following notes on various aspects of bomb damage collected from some of the authorities which are best qualified by their experiences to give advice should prove of general interest.

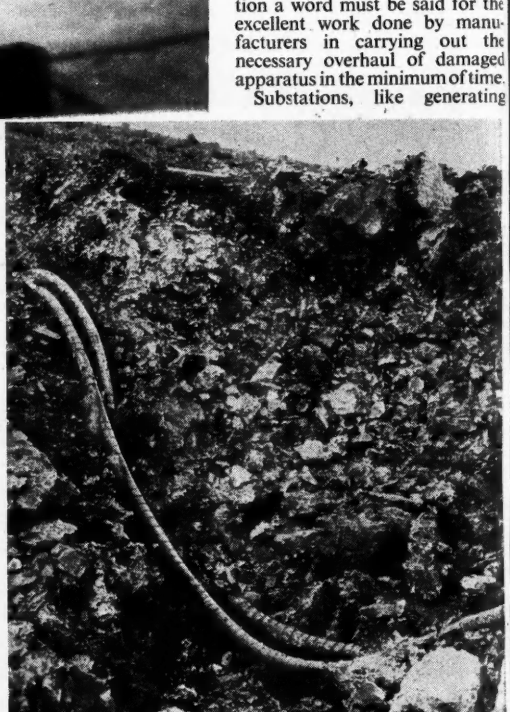
Without giving away any secrets to the enemy we may say that it was inevitable that of the very large number of bombs dropped during a period of over twelve months, some lucky, or rather unlucky, ones at least should from the very law of averages have come to ground on or near power stations. Even where this has happened, thanks to the design of the modern power station and the special precautions taken against blast and fire, the actual damage has generally been purely superficial. Actually, one of our newest generating stations which had a direct hit on the boiler house roof sustained no harm that bricklayers and concreters could not put right in a few weeks, the plant itself being unscathed. Apart from a few honourable scars there was no sign of its maltreatment when we visited it a few weeks after the incident.

Actually, in some instances damage to power stations is looked upon rather more in the

A large bomb crater through which passed telephone, pilot, DC and AC low-voltage, 6-kV, 11-kV and super-voltage cables

light of annoyance and a test of endurance than anything else. One undertaking has had the turbine house roof blown off twice and the chief engineer referring to it told us that he would have to summon all his sense of humour to see the funny side of it if it were blown off again. "Still," he said, "the enemy comes along and blows the place up and you set to work to put it together again. When with the praiseworthy help and enterprise of the contractors you eventually see order arise from chaos, you begin to wonder what there is to talk about. I suppose it resolves itself into a trial of who gets tired first."





The cores on this 11-kV joint (above) were pulled out by blast so cleanly and rapidly that no fault developed, the cable remaining alive. The 0.1 sq. inch, 11-kV cables (right) remained alive and feeding although stretched from 11 to 21 ft.

After damage has occurred at a power station the restoration of supplies has been much simplified both by the existence of the grid and by the foresight shown in providing a pool of apparatus upon which undertakings can call. With reference to this, however, the importance of each undertaking planning well ahead exactly what it will do in the event of damage to each particular section of its plant is emphasised. If this is done even the most serious "mishap" assumes a straightforward aspect and a great deal of wear and tear on the engineers responsible is avoided. To quote one actual instance a hign-explosive bomb completely wrecked the switchhouse of one generating station. Yet, due to a cut and dried scheme of action, supplies were restored within the remarkably short period of 24 hours, despite a slight delay in the delivery of the pool gear—a delay which, incidentally, would not be likely to recur to-day, now that the procedure for obtaining the apparatus has been studied and improved.

The pool gear installation is, of course, only an emergency measure and not intended for permanent use. Furthermore, supplies of this gear are not unlimited and it is of importance to get it released at the earliest possible moment. In this connection a word must be said for the excellent work done by manufacturers in carrying out the necessary overhaul of damaged apparatus in the minimum of time.

Substations, like generating stations, stand up to an enormous amount of punishment, unless, of course, they receive direct hits, and seldom sustain worse harm

than blown-out doors, windows, or roof lights: here incidentally the protection provided for the apparatus has been invaluable as an immediate protection against rain. But even if, in the case of the less substantially constructed units, more serious damage is done to the structure, the chances are that the transformers, switchgear, etc., installed will still be serviceable.

As an example we were recently shown a substation which had until recently been constructed of breeze-blocks in order to harmonise with a housing estate. A bomb caused the walls and roof to collapse completely over the plant, which, however, still continued to function. It was, indeed, possible to clear away the débris and build a brickwork erection round it without disturbing the apparatus. The protection of transformers by building round them sandbag walls from 2 ft. 3 in. to 3 ft. thick or double walls of sheeting filled with ash has been found effective in preventing damage due to flying iron roof principals and splinters of all kinds.

The result of bomb blast on steel tape armoured cable

With regard to rotary substations, several points again emphasise the importance of being ready for all emergencies. The precaution has been adopted by some undertakings of building frameworks over the machines, covering them over with galvanised sheets. This arrangement has undoubtedly prevented severe damage from falling glass and burning timber.

Damage by Mud and Water

In addition to damage caused by débris, etc., from blasted buildings or road surfaces a considerable danger arises from the blasting of mud into the windings of the machinery, especially in dry weather. The mud also has a tendency to pack underneath the brush gear almost like granite, and the windings and the end-risers become one solid mass. The necessary protection is easily afforded by means of shields. In cases where roofs have been lost by blast, portable canvas structures are proving invaluable for enabling the machines to be re-started in the minimum of time and also for protecting them from the weather.

Naturally, considerable damage has been caused to the plant in some instances by water, but in practically all cases it has been found possible to dry out without permanent injury. A further complication is provided in certain coastal areas where salt water is employed for fire fighting. Some engineers have even contemplated washing the plant down with fresh water, but we have not yet heard of such drastic treatment being actually applied.

The modern brick-built substation seems to withstand fire equally well as blast and we recently saw one standing intact, the sole remaining building in the centre of a wide expanse of burnt-out premises. In the old types of building damage appears to be limited to the destruction of the wooden under-sheeting and principals of slated roofs caused by sparks blown from burning adjacent buildings into crevices, notwithstanding the efforts of the roof fire-watchers. The great thing is to prevent the incendiaries from lodging in the roof or in the gear, and it is recommended therefore that, besides enclosing the equipment wherever practicable the roofing should be as thin as possible. The incendiaries will then in most cases fall straight through the roof, glance off the gear if it is underneath and burn out harmlessly on the concrete floor. For the protection of switchboards and other vital apparatus and machinery "Durasteel" sheeting has fully justified the claims made for it. We have seen several instances in which it has saved valuable plant beneath and has itself sustained no worse damage than discoloration.

Substation Fires

Though fires in substations caused by incendiaries are uncommon, it is a sound scheme to have an arrangement with the fire service to notify the electricity undertaking if fires occur affecting any of its property, since it is obviously undesirable and dangerous for the Fire Service, which is in any case not

normally provided with foam apparatus necessary for dealing with burning transformer oil, to work among live gear.

The importance of being in close touch not only with the Fire Service, but with the other civil defence services and public utility undertakings does not need emphasising. From the electricity undertakings' point of view it enables its repair work to be carried out speedily on specific instructions and with the maximum co-operation with the water, gas, G.P.O. and transport services. On occasions electricity undertakings' own private telephone systems serving substations, etc., have proved invaluable for keeping communications open when the G.P.O. services have been affected Radiodiffusion services have also played an important part in giving warnings of imminent danger to the locality.

Effects upon Cables

As might be expected the greatest amount of damage which supply engineers have to face is that caused by bombs to underground cables. Actually, however, experience has shown that paper-insulated, lead-sheathed and armoured cable stands up to very severe damage, irrespective of voltage, and we may mention that on one occasion it was only the electric cables which held up a damaged bridge.

Numerous instances have occurred where the cables, depressed and twisted many feet below the laid level, have not failed. From observations made of these cases it has sometimes, though not always, been found that the stretching of cables laid direct in the ground has been confined to the length of cable in the crater, and does not extend any appreciable distance on either side. Frequently any slack in existence in adjoining manholes has been sufficient to prevent damage to joints. Where cables are drawn through ducts it is found, as might be expected, that they are pulled along the duct towards the crater and the wipes of joints are torn away from the lead sheath, often two or three manholes away from the crater.

Disturbance of Joints

Sometimes this pulling of cables in ducts extends for a considerable distance—in some cases as far as 300 or 400 yards. In these cases as many as three straight-through joints in series have been pulled out, and the cables pulled up to the nearest bend in the duct run, where the ducts are usually disturbed and the cables pulled tight on the corner. Sometimes it is found that the cores have been broken inside the lead sheathing.

In other instances where the feeder cables were not harmed switching out has occurred due to damage to the comparatively frail pilot cable. Such incidents can often be detected by the absence of the earth leakage alarm signal. A reference to the position of joints in regard to a crater should be made in order that any joint in the immediate vicinity can be remade. Another form of cable trouble liable to occur at outdoor transformer points in rural areas is injury of the lead sheath by falling splinters, and the precaution should always be taken of providing suitable strong covering.

It is obviously inadvisable to retain the normal method of having the whole of a network interconnected by means of feeder pillars and substations; systems should be divided into as many areas as possible in order to localise the effect of any damage, to relieve the strain on converting plant and to reduce short-circuit energy developing at the site of the fault.

This makes it possible also to divide up the personnel (mains engineers, junior assistants and mains foremen) to operate in separate districts, and thus faults in all districts are covered simultaneously. Many undertakings have also been saved from very serious interference with the maintenance of supplies by forethought in providing alternative duplicate or even triplicate primary transmission systems at various points, and it should be the aim of every authority to see that there are as many feeding points into the system as possible. Duplicate supplies to especially important consumers have similarly helped enormously. In an early issue we hope to outline some of the measures that have been taken to restore supplies after air raids.

Factory Accidents

IN its abbreviated form of twenty-four pages, the annual report of H.M. Chief Inspector of Factories for 1940 (Stationery Office, 4d. net) has been issued without the statistical tables which are usually included.

During the year there were 1,372, fatal and 230,607 non-fatal accidents in industry, being about 24 and 20 per cent. more than in 1939. Much of the increase, representing loss of production as well as human suffering, is due to preventable causes.

The effect of new labour in works is shown by the increases of 33 per cent. in engineering works (including 56 and 48 per cent. for milling machines and power presses). In a shipbuilding yard, however, with an efficient safety officer, the number of accidents has fallen from 0.95 per cent. in 1938 to 0.66 per cent. in 1940. As a result of efforts to improve ventilation consequent upon the black-out (through the adoption of plenum, unit and extractor-fan systems) many factories are now ventilated more efficiently than before the war.

The report emphasises that for work involving close detail, the minimum general lighting standard laid down in the new Regulations needs to be supplemented by additional lighting, either local or general. Glare from lamps, unshaded or fitted with old types of shallow reflectors, is still prevalent. Often the efficiency is spoiled by dirty lamps and fittings and the retention of worn-out lamps; in some instances illumination has been increased by 75 per cent. by attention to these points.

PERSONAL and SOCIAL

News of Men and Women of the Industry

FURTHER to our last week's note on the adoption of the chief electrical engineers' salary scale by the Islington Borough Council, it is now stated that the salary of the Islington borough electrical engineer, **Mr. A. P. MacAlister,** is to be raised from £1,350 to £1,576, plus £18 cost of living bonus, for the period ending March 31st, 1942. Mr. MacAlister, as hon. secretary for the chief engineers, was one of the signatories of the agreement made last July.

Mr. R. Alan S. Thwaites has been appointed assistant deputy electrical engineer to the Manchester Corporation. Mr. Thwaites was educated at Dulwich College and the City and Guilds (Engineering) College and received his practical training with W. H. Allen, Sons & Co., Ltd., with whom he remained until 1922. During this period he carried out work in connection with the design, testing and erection of machinery for generating stations and for the Admiralty. In 1922 he joined the Yorkshire Electric Power Co., and served under the late Mr. W. B. Woodhouse in various capacities until 1935 when he joined the North Wales Power Co., of which he was appointed engineer and manager in 1939.

Mr. R. A. S. Thwaites

Mr. Thwaites is a member of the Institutions of Civil, Electrical and Mechanical Engineers and is on the Committee of the Liverpool Centre of the I.E.E.; he has served as a member of the District Board and District Council for the Electricity Supply Industry as well as upon various committees of E.D.A. He is a past-chairman of the Yorkshire Centre of the Institution of Civil Engineers. In 1939 he was appointed a member of the Area Committee and in 1940 of the National Committee of the Central Electricity Board.

The Governors of Robert Gordon's Colleges, Aberdeen, on October 31st, approved a recommendation that **Mr. G. H. Rawcliffe,** M.A., A.M.I.E.E., of Liverpool, should be appointed head of the Electrical Engineering Department, subject to the approval of the Scottish Education Department. Mr. Rawcliffe is known to our readers as an occasional contributor of articles to the ELECTRICAL REVIEW.

Mr. L. Leighton, A.M.I.E.E., has been appointed engineer-in-chief of Mersey Docks and Harbour Board in succession to **Mr. T. L. Norfolk,** who has retired. He had been principal assistant to Mr. Norfolk since 1928.

Mr. E. J. Robertson, B.Sc.Tech., A.M.I.E.E., at present with the Air Ministry Works Directorate, has been appointed assistant electrical engineer to the Manchester Corporation Transport Department. He received his education at Manchester University, and was previously in the employ of the Metropolitan-Vickers Electrical Co., Ltd., the English Electric Co., Ltd., and the London Passenger Transport Board.

Mr. W. Nithsdale, formerly a director of Yarrow & Co., has been appointed to the board of Richardsons, Westgarth & Co., Ltd.

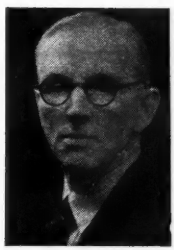
Mr. H. C. Palfrey, A.M.I.E.E., has resigned his position as chief tester to the Shropshire, Worcestershire & Staffordshire Electric Power Co., and is joining the technical staff of H. Miller & Co., Ltd., Birmingham. Mr. Palfrey was educated at Lawrence's College, Birmingham, and Birmingham Central Technical College, and has held positions with Peterborough Corporation Electricity Department and Chamberlain & Hookham, Ltd.

A farewell luncheon to **Mr W. E. Hobbs** was given by the directors of the General Electric Co., Ltd., recently at the Connaught Rooms, London, a number of his old colleagues also being present. Lord Hirst occupied the chair and paid a warm tribute to Mr. Hobbs for his long and faithful service as the company's South Wales district manager, and expressed the wishes of the directors and of all Mr. Hobbs' colleagues in the company that he would enjoy a well-earned retirement. Lord Hirst then presented several pieces of silver plate to Mr. Hobbs; a rose bowl from himself and Mr. M. J. Railing and a salver and three dishes from Mr. Hobbs' colleagues. In his reply, Mr. Hobbs indulged in reminiscences covering nearly 50 years of experience with the G.E.C.

Mr. C. D. Taite, M.I.E.E., has been appointed managing director of Lancashire Electric Power Co., of which he has been engineer and manager since 1907.

Mr. R. Foot, general manager of the Gas Light & Coke Co. and chairman of the Joint Gas & Electricity Committee, has been appointed general adviser on the wartime organisation of the British Broadcasting Corporation.

At its meeting on October 29th Birkenhead Town Council confirmed the Electricity Committee's unanimous recommendation to appoint **Mr. F. W. Brecknell,** A.M.I.E.E., as borough electrical engineer in succession to the late Mr. F. E. Spencer, with whom he was associated at Birkenhead for more than forty years. After occupying positions of responsibility in various departments, he was in 1926 appointed deputy borough electrical engineer. The salary attaching to the present appointment is £1,000 a year, rising by two annual increments of £50 to £1,100, plus car allowance.



Mr. F. W. Brecknell

Owing to the resignation of **Mr. T. A. Molyneux,** assistant shift engineer, upon going to the Wimbledon Corporation undertaking, the following staff

re-arrangement at the Clarence Dock station, Liverpool, has been approved:—**Mr. B. Lear,** turbine engineer, to be assistant shift engineer; **Mr. A. R. Cain,** assistant turbine engineer, to be turbine engineer; and **Mr. S. Livingstone,** temporary assistant turbine engineer, to be assistant turbine engineer.

Croydon Corporation Electricity Department has appointed **Mr. H. E. Thompson,** of Bradford, as charge engineer.

Mr. J. L. Baird has accepted an appointment as consulting technical adviser to Cable & Wireless, Ltd.

Mr. W. L. Burrows has been appointed a director of W. & T. Avery, Ltd.

Mr. D. G. Sinfield, manager of C. A. Parsons' Walkergate welding works, Newcastle-on-Tyne, is the new chairman of the North-Eastern (Tyneside) branch of the Institute of Welding.

Mr. Price F. White, formerly electrical engineer, Bangor, has been re-elected chairman of the North Wales and South Cheshire Joint Electricity Authority.

Mr. R. W. Smith, assistant distribution and transmission engineer with Aberdeen Corporation Electricity Department, was married at Cults West Church recently to Miss Margaret W. Watt.

Alderman J. Buckley, who is to be the next Mayor of Mossley, is chairman of the Stalybridge, Hyde, Mossley and Dukinfield Transport and Electricity Board.

Burnley Electricity Committee has adopted a resolution expressing appreciation of the services rendered by **Mr. J. E. Starkie,** borough electrical engineer, during his forty years' municipal service.

Mr. W. R. Montgomery, A.M.I.E.E., managing director of the Alton Battery Co., Ltd., has been elected president of Alton and District Chamber of Commerce.

Lt.-Col. C. G. Vickers, V.C., has been appointed a member of the London Passenger Transport Board and will hold office for seven years. He is a director of the Ministry of Economic Warfare.

Islington Borough Council Electricity Committee has appointed **Mr. W. C. England,** of Beckenham, as relief charge engineer.

Sir Herbert H. Couzens has been elected president of the Brazilian Traction, Light and Power Co. in succession to the late Mr. Millar Lash. **Mr. R. H. Merry** has been elected to the board to fill the vacancy.

Sir Harry Brown, chairman and joint managing director of the British General Electric Co. Pty., Ltd., has been appointed Director of War Organisation of Industry by the Commonwealth Government.

Mr. W. E. Maclean has been re-appointed Commissioner of the Government Hydro-electric Department of Tasmania. Applications for this position were invited in July and the Government's decision was made after considering seventeen applications. **Mr. J. E. Heritage** has been reappointed an associate commissioner, and **Mr. C. E. H. Ferguson,** a member of the Commission's staff, has also become an associate commissioner.

The *Electrical Engineer and Merchandiser* (Australia) reports that **Mr. T. Malcolm Ritchie,** managing director of Noyes Bros., Sydney, and Crompton Parkinson (Aust.) Pty., Ltd., has been appointed New South Wales consultant to the Board of Factory Administration of the Ministry of Munitions. Mr. Ritchie, who is a member of the Electricity Advisory Committee of New South Wales, has had extensive experience of factory organisation and management.

Mr. A. W. Clegg, who recently resigned from the position of borough electrical engineer of Accrington on account of that authority's decision not to adopt the salary scale of the National Joint Committee, has asked permission to withdraw his resignation.

Mr. H. H. Wiggans, consumers' engineer with the Worthing undertaking, has resigned to take up an executive appointment with the Britannic Electric Cable & Construction Co., Ltd.

Obituary

Flight-Lt. G. F. Gregory.—Our readers will join with us in sympathy with Mr. G. F. Gregory, borough electrical engineer of Ilford, in the loss on active service of his son, Flight-Lt. George F. Gregory, who was twenty-three years of age.

Sec. Lieut. J. A. Newton.—Our sympathy is also extended to Mr. C. A. Newton, principal of C. A. Newton & Co., Ltd., of Derby, whose son, Second Lieut. John A. Newton, died recently while on service overseas.

Mr. G. P. Shallcross, A.M.I.E.E., borough electrical engineer of Birkenhead from 1913 to 1926, died a few days ago, at the age of eighty-two. Readers will recall that his successor at Birkenhead, Mr. F. E. Spencer, died recently.

Mr. W. W. Marriner, who had been associated with Yarrow & Co., Ltd., for over half a century and had been a director for several years, died last week at Halifax, Canada, where he had gone on important business. Mr. Marriner joined the company at Poplar, London, and was closely associated with the late Sir Alfred Yarrow in the development of high speed vessels. He also was prominent in the introduction of the Yarrow water tube boiler and was responsible for many important improvements in marine engineering.

Prof. F. Lobligeois.—A *Reuter* message from Vichy records the death in Paris recently of Professor Felix Lobligeois, the well-known radiologist. He had undergone successive amputations, which led to the loss of both arms, but refused to give up his research work, despite the effects of continued close contact with radium.

Major A. H. Huddart.—The death occurred on October 28th at Chertsey of Major Alfred Harry Huddart, R.A.S.C., M.B.E., of Newcastle-on-Tyne. He was an associate member of the Institutions of Civil, Electrical and Mechanical Engineers.

Mr. J. R. Curtis, chief assistant consulting electrical engineer to the Central Mining and Investment Corporation, Ltd., Johannesburg, died recently.

Wills.—The late **Mr. Arthur Chamberlain,** a director of the General Electric Co., Ltd., and of Tube Investments, Ltd., left estate valued at £310,683 (net personalty £306,336).

The late **Mr. Thomas Ormiston Callender,** a director of Callender's Cable & Construction Co., Ltd., and son of the late Sir Tom Callender, left £183,297 (net personalty £137,892).

Network Calculations

Thevenin's Theorem

By T. F. Wall,
D.Sc., M.I.E.E.
(University of Sheffield)

THE great developments which have taken place in recent years in the interconnection of large power stations, the ever increasing complexity of the networks involved in low-voltage distribution and the intricacy of the circuits which are now commonly used in radio engineering systems, all emphasise the necessity for the introduction of methods which shall be as simple, direct, and comprehensive as possible for the investigation of the current and voltage relationships in the various links of such networks.

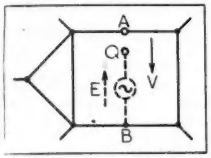


Fig. 1

One of the most powerful methods available for the treatment of a wide range of such problems both in heavy-current and light-current engineering work is Thevenin's theorem. One form of the statement of the theorem is as follows :—" When two points A and B in a network are connected together either directly or through an impedance link, the changes in current and voltage which will occur are the same as those which would be produced by an e.m.f. injected into the connection between the two points A and B, this injected e.m.f. being such that it is at each instant equal to that p.d. which existed across the two points A and B before the connection had been made."

This theorem was first enunciated by Helmholtz in 1853.* The French scientist Thevenin† re-discovered it in 1883 for DC circuits but it was then largely forgotten until Pleijel recalled it and showed that it was equally applicable to steady AC circuits as well as to transients.

A judicious application of this theorem can lead to immense simplifications in calculations relating to complicated circuits such as the parallel operation of large power stations. It has also proved to be a most powerful method for solving problems associated with thermionic valve amplifier circuits.

An essential condition for the application of the theorem is that the circuit elements shall be linear, that is to say, the voltage must always be directly proportional to the corresponding current. Even when this requirement is not always fulfilled however, *e.g.*, in the case of circuits comprising iron-core inductances, good approximations can be obtained by estimating a reasonably close equivalent linear relationship.

Suppose fig. 1 represents a portion of a network and that a p.d. V exists between the points A and B. If a generator of zero resistance is connected at one terminal to the point A whilst the other terminal is at Q, and if the e.m.f. E which is developed by the generator is equal and opposite to the voltage V between the two points A and B, that is if $E+V=0$, then clearly, no change will be introduced into the system if the point Q is now connected to the point A. If however, the e.m.f. E now disappears, the voltage V will be available to drive a current through the connecting link BQA and round the rest of the network circuit. Further, if this connecting link has no resistance, the current which will flow will be of such a magnitude that the p.d. V will be reduced to zero.

As a first example, the case of the Petersen coil method of arc suppression will be considered as shown in fig. 2 (*a*) in which an arc is assumed to strike from line to earth at the point A. Normally, the point A will have the phase potential V to earth and thus can be assumed to be counter-balanced by a generator e.m.f., E, so that $V+E=0$. If now the e.m.f.

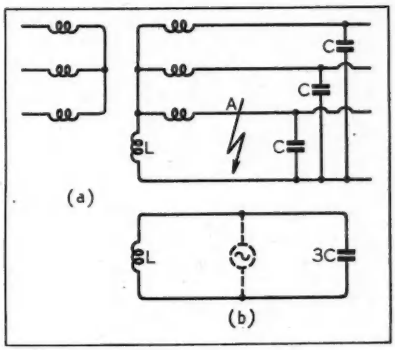


Fig. 2

E fails (this corresponding to an arc short-circuit across AB), then the three-phase line voltage will become unsymmetrical and will be equivalent* to the superposition on the normal symmetrical three-phase system of

* Pogg. Ann. 89. † C. R. Acad. Sc., Paris, 97.

* This is a simple example of the analysis of an unsymmetrical three-phase system into symmetrical components.

three co-phasal e.m.f's., *viz.*, one in each line, equal in magnitude to the phase voltage V and these three equal and co-phasal e.m.f's. will act round the circuit of the capacitance $3C$ in series with the inductance L of the Petersen coil as shown in fig. 2 (*b*). It is well known, however, that if resonance exists in such a circuit, that is to say, if $\omega L = \frac{1}{\omega(3C)}$ then no current will flow through the generator and consequently the arc which strikes to earth at the point A will die out.

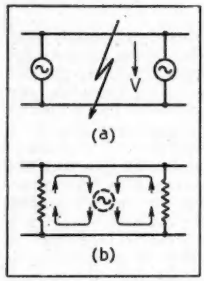


Fig. 3

Another example is that of several generators operating in parallel and a short-circuit takes place across the busbars as shown in fig. 3 (*a*). The equivalent circuit is then as shown in fig. 3 (*b*) in which it is assumed that the balancing generator e.m.f. E has become reduced to zero so that the short-circuit current which will flow will be that due to the p.d. V acting on the effective reactance of the parallel grouping of the generator as shown in fig. 3 (*b*).

A good example of the general principles involved in the application of Thevenin's theorem is the network shown in fig. 4 (*a*). The resistance of each branch of the network is marked in the diagram and the problem is to find the magnitude of the current which flows in one of the links, *e.g.*, the link AC.

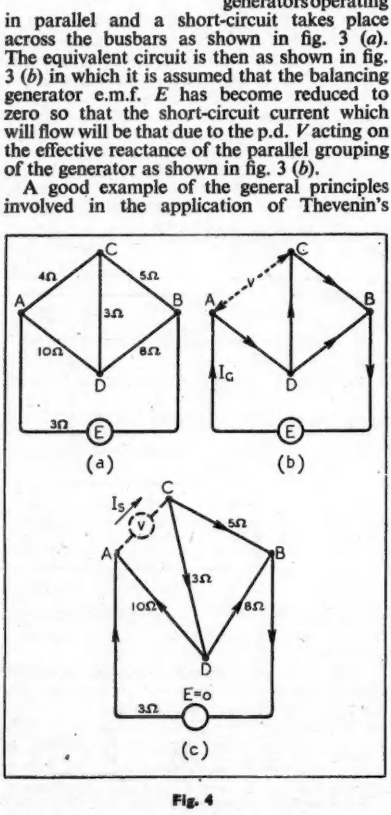


Fig. 4

(i). The first step is to assume that the link AC has been removed from the network and then to calculate the p.d. V which will exist between the points A and C as shown in fig. 4 (*b*). Thus, the resistance from A to $B = \frac{8 \times 8}{16} + 10 = 14$ ohms and the current $I_G = \frac{E}{14+3} = \frac{E}{17}$ = (current in DCB + current in DB). A simple calculation continued in this way

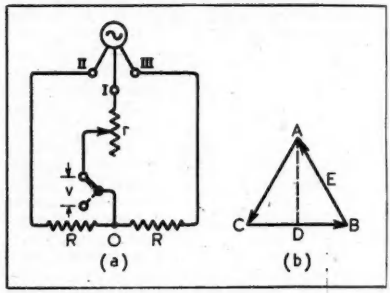


Fig. 5

shows that the p.d. across the points A and C is $V = 0.676\ E = 67.6$ volts when $E = 100$ volts.

(ii) The next step is to assume that the generator e.m.f. E is reduced to zero and a p.d. of $v = 67.6$ volts is applied across the points A and C as shown in fig. 4 (*c*). In this case the current which will flow between the points A and C can be shown to be $I_S = 14.5$ amperes. That is to say, the resistance of the network between the points A and C will be $R_S = \frac{V}{I_S} = \frac{67.6}{14.5} = 4.66$ ohms. If now the link AC of 4 ohms resistance is replaced in position in the network as shown in fig. 4 (*a*), the current which will flow in this link will be $I_{A:C} = \frac{v}{R_S + 4} = \frac{67.6}{4.66+4} = 7.8$ amperes.

Another practical example is the problem of obtaining a current of variable magnitude which shall be in phase with one of the voltage phases, such a current being required for example, to operate a single-phase wattmeter or a wattmeter type of relay. The following device shows how this can be done by means of a single variable resistance.

In fig. 5 (*a*) the phases *II* and *III* are connected by a non-inductive resistance having a centre-tapping at 0 and such that the resistance in each half is R. The phase *I* is connected through an adjustable resistance the sliding

(*Concluded at foot of next page*)

"Engineering—Unlimited"

The Need for an All-round Maintenance Service

By H. E. Johnson

HOW often does one scan the pages of the Classified Trades Directory or ring up the local Chamber of Commerce to find a firm to quote for maintenance service on some item of plant a little out of the ordinary in the matter of design or application?

I have often had to put in quite a considerable time before finally hitting upon a suitable firm or organisation, although the service required may be in respect of plant portions of which are in common everyday use. Take for example the mechanisation of an annealing furnace or muffle. When of any size, the normal muffle plant presents few or no difficulties in maintenance and any adjustment other than that which can be tackled by the man operating it is left to the maker.

However, if this type of plant is mechanised by the installation of special conveyors in conjunction with a relatively complicated system of electrical control gear, then the matter of who shall do and be responsible for maintenance servicing becomes complicated. The furnace man does not feel competent to take on the care and attention of the mechanical parts; neither does the conveyor maker want the trouble and trials of a furnace. Recognising the need for efficient maintenance on the majority of engineering services installed in a modern works, one either employs a "maintenance engineer" on a full-time basis who attempts to deal, with or without a small staff, with all services in those works, or asks outside firms to send in at stated periods to attend to adjustments and cleaning.

Inevitable Overlapping

When one reads the advertisements in the technical Press for "works engineers" and notes the salaries offered for the posts, one sees the justification for having specialists in. This course has its own disadvantages. There is the inevitable overlapping of duties on certain services, *e.g.*, electrical and mechanical on a printing machine (non-standard) and electrical and hot-water trades on electrode boilers. Cases of this sort can be instanced almost *ad infinitum* and the cost of maintenance service becomes, under these conditions, a quite considerable item.

We have all had experience of the type of contractor who is prepared to take money for service to plant which he sometimes admits he has never seen, let alone had experience with. One electrical contractor who was quite prepared to maintain in efficient working condition a Diesel-engined generator with batteries had never seen a cold-start oil engine or indeed any oil engine at all. He admitted he knew of them and vouchsafed the opinion that this one was a good type.

A Versatile Organisation

There is, I maintain, a great opportunity for an engineering organisation to take on maintenance work of *all* descriptions under the one roof so far as organisation is concerned. The scope of such a concern could be unlimited in these and post-war days.

I am fully aware of the fine services rendered by the big engineering insurance companies, which maintain large staffs of specialists who will advise and act as consultants on any engineering service. This is not all that is required however. The insurance companies will not do the actual work and do not employ, shall we call them, "industrial staffs." The requirements of the brain of such an organisation as I have envisaged would be as follows: An engineer in the true sense and meaning of the word, with a staff of specialists each having his competent outside staff of engineers—electrical, mechanical, heating and ventilating, and structural.

Perhaps until an engineer really does do engineering in its widest aspect, the status of this benighted profession will cause it to continue to be the milch cow of "the office."

Network Calculations (*concluded*)

contact of which can be connected to the point D through a switch. When the switch is open, there will be a p.d. V across the contacts where $v = \frac{\sqrt{3}}{2}E$ as shown by AD in the vector diagram of fig. 5 (*b*). When the switch is closed, Thevenin's theorem shows that the current which will flow in the variable resistance r will be*

$$i_s = \frac{v}{r+\frac{R}{2}} = \frac{\sqrt{3}E}{2r+R}$$

* See also *ASEA Journal*, April, 1927.

Welded Steel Parts

HOW welded steel machine parts can be used to replace drop forgings and pressings is described in welding memorandum No. 5 issued by the Advisory Service on Welding, Ministry of Supply Directorate of Scientific Research, Great Westminster House, S.W.1. This 12-page booklet illustrates by means of 72 sketches how component parts of many types can be produced readily by welding standard steel shapes.

CORRESPONDENCE

Letters should bear the writers' names and addresses, not necessarily for publication. Responsibility cannot be accepted for correspondents' opinions.

Engineers' Salaries

MUCH has been written on this subject, mainly with reference to the salaries paid to engineers who have had the good luck to obtain a corporation post, but so far I have seen no such plea for those equally good engineers employed as designers and engineering estimators by the manufacturing firms.

Whereas many municipal engineers for whom more and still more money is sought, are paid four-figure salaries, their unfortunate colleagues with just as much and sometimes more technical training and ability to their credit, have to struggle along on about a third or a quarter of these salaries; yet they cannot buy food and clothes or education for their children at one-third the cost.

The engineers employed by manufacturers are responsible for designing, quoting for and building the plant and all auxiliaries required in, say, a modern power station, and these men have to educate people getting from three to four times their salary, into the intricacies of the equipment. The manufacturing concerns surely cannot plead ignorance of this state of affairs, for they have only to look at the advertisements of Corporation appointments. Frequently when a post is advertised an E.P.E.A. notice appears recommending that the salary be pushed up another £300 or £400.

We have had to go through the same technical training and our responsibilities in making the plant are greater and more exacting in detail than those who merely operate it. The differences in salaries as between the two are so marked and so grossly unfair that it would be to the everlasting credit of the rich manufacturing concerns if they reviewed the salaries paid to the members of their technical staffs. They cannot put forward the age-old plea of poverty under present conditions.

WILLIAM ANDREWS.

Stretford, nr. Manchester.

Temperature and Resistance

IN his article in your issue of October 24th, Mr. Bacon makes no reference to the materials whose resistance and temperature characteristics he is discussing. The α in the formula

$$R_2 = R_2 (1 + \alpha (t_2 - t_1))$$

is the resistance-temperature coefficient and the figure he substitutes (.00393) is that for copper.

In paragraph 3 Mr. Bacon refers to a resistance which rises from 4.3 to 6.4 ohms, again mentioning no material. Since commercial resistances are generally not wound with copper wire it is surely desirable to point out that a new value of α, corresponding to the material must be substituted if useful results are to be obtained. The following typical figures for resistance materials, taken from Messrs. Wiggin's list, will illustrate the point, and it will be seen that unless proper regard is paid to a considerable errors will result :—

Material	*Temperature coefficient* (α)
Ferry	.000014
Glowray	.0002
Dullray	.001
Nickel	.005
Iron	.0062

Chart I appears to be based on the constant of 2.61 given in the text immediately above it, and since this appears to be $\frac{1}{100\alpha}$ surely the figure is nearer 2.55, if α is taken at .00393.

Bedford. C. MACKECHNIE JARVIS.

Training for Installation Work

REGARDING Mr. H. Sanderwitch's letter in your issue of October 24th, I would strongly advise him to seriously consider the electrical installation courses formed jointly by the Electrical Contractors' Association and the City and Guilds of London Institute.

These courses are now in operation at most of the technical colleges in this country and the authorities will no doubt be pleased to give Mr. Sanderwitch all the necessary details. Appropriate examinations are set and certificates are awarded to the successful candidates.

Birmingham. T. SIMMONS.

Coal Clause Variables

ON reading the leaderette in your issue of October 24th, "Coal Clause Suggestion," I notice that you imply that this is rather a new departure.

I enclose herewith a copy of a coal clause which has been in operation in this Department for many years past. It is a last safeguard in the event of fuel deteriorating beyond normal limits. I think this might be of interest to you and I do not think there is any hardship in operating this clause.

Barrow-in-Furness. JAS. E. SHEPHERD,
Borough Electrical Engineer.

[The coal clause employed at Barrow provides that charges shall be varied according to increases or decreases in the calorific value of the coal used. We believe that this is not uncommon, but it does not involve the efficiency of generation as the Leeds proposal does, and that was the point of our leaderette.—EDS., ELEC. REV.]

Importance of Paper

An Appeal to the Industry

NOBODY who reads the newspapers or listens to the B.B.C. programmes can be unaware of the urgency of the need for gathering in all the spare paper available for use in the production of munitions of war. Much has been done already in the salvaging of waste paper but all of us know of untapped resources capable of providing many hundreds of tons of this vital material.

The electrical industry is particularly interested in the subject for paper enters very largely into a number of products which it is making in the course of its share in the war effort. It is therefore right and just that the industry should do all that can be done to increase the flow of paper returning to the mills for conversion into board and other valuable products.

In every works, office, shop and showroom in every branch of the electrical industry there is much paper hitherto considered of some value but a great deal of which is of questionable use. The time has come to apply a more rigid conception of what is of value and what can be dispensed with.

Records and Catalogues

In the offices of most electricity supply undertakings there will be found consumers' records dating back many years, available for reference if disputes arise, as they seldom do—at least after two or three years of service. At the best they take up a great deal of useful space and gather quantities of dust and a lot of them should be cleared out anyway, if only from the accommodation and hygienic aspects. How much more is it desirable to remove them now. And the process need not stop there. Many engineers and their assistants have a "catalogue complex" and hoard hundredweights of manufacturers' publications, largely of "academic" interest. Let them turn upon these free libraries with a ruthless hand and weed out all but the obviously essential.

Old numbers of technical periodicals also abound in these offices. It is worth while for the engineer to get a reliable member of his staff to cut out from these anything likely to prove useful and abandon the rest. We, and our contemporaries, are generally able to provide information regarding past articles and developments when it is needed and so if by mischance they throw anything useful away they can fall back on us.

A great deal of what we have said applies equally to electrical contractors and manufacturers. In the mass they are a possible source of immense quantities of waste paper. We appeal to them to let it go.

Correspondence files represent another reservoir of matter which, void of practical use, could be made to serve an extremely useful purpose. Drawings and blue prints of designs long superseded are frequently hoarded and in many works we have been struck by the number of obsolete posters which are allowed to remain on the walls because it is apparently nobody's job to remove them. The latter may seem to be a small thing but in the aggregate these trifles may assume gigantic proportions.

The managements of all supply undertakings and industrial establishments should appoint a man to look after these matters. The need is urgent. See to it that action is taken now.

Forthcoming Events

Institution of Electrical Engineers.—Thursday, November 20th, 4 p.m. London. Paper: "Characteristics and Performance in Service of High-voltage Porcelain Insulators," by Mr. J. S. Forrest.

Meter and Instrument Section.—Friday, November 7th, 4 p.m. London. Inaugural address by the chairman, Mr. W. Phillips.

Transmission Section.—Wednesday, November 12th, 4 p.m. London. Inaugural address by the chairman, Mr. S. W. Melsom.

Installations Section.—Thursday, November 13th, 4 p.m. London. Mr. A. G. Ramsay to open informal discussion on solving wartime electrical problems.

North-Eastern Centre.—Monday, November 10th, Neville Hall, Westgate Road, Newcastle. Paper: "Metal Rectifiers," by Dr. A. L. Williams and Mr. L. E. Thompson.

North-Western Centre.—Saturday, November 8th, 2.30 p.m., Engineers' Club, Albert Square, Manchester. Papers: "Control of the Domestic Load" and "Optional Control System of Domestic Supply," by Mr. P. Schiller.

Scottish Centre.—Tuesday, November 11th, 6 p.m. Heriot-Watt College, Edinburgh. Paper: "Electric Discharge Light Sources and the Utilisation of Fluorescence," by Mr. M. W. Hime.

Western Centre.—Monday, November 10th, 5 p.m. Merchant Venturers' Technical College, Bristol. Paper: "The Characteristics and Applications of the Selenium Rectifier," by Mr. E. A. Richards, B.Sc. (Eng.).

North Midland Centre.—Saturday, November 15th. Paper: "The Characteristics and Performance in Service of High-Voltage Porcelain Insulators," by Mr. J. S. Forrest.

Junior Institution of Engineers.—Saturday, November 15th, 2.30 p.m., 39, Victoria Street, S.W.1. Annual general meeting.

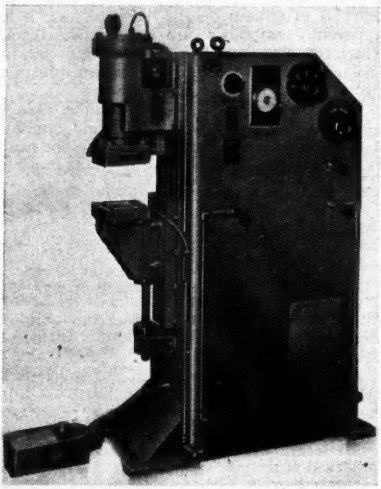
Illuminating Engineering Society.—Tuesday, November 11th, 2.30 p.m. Lighting Service Bureau, London, W.C.2. Paper: "Industrial Lighting in Reconstruction," by Mr. H. C. Weston.

RECENT INTRODUCTIONS

Notes on New Electrical and Allied Products

Projection Welding Machine

As a manufacturing process projection welding is capable of quick work without the necessity for highly trained specialist operators. While any one machine cannot cover the full range—some are being built up to 1,250 kVA—probably the most popular size at the present time is a smaller type capable of



"Metrovick" 60-kVA projection welding machine

welding three or four projections simultaneously on the thinner gauge materials, like studs on flat surfaces, and producing a weld of about ¼ in. diameter. The example made by the METROPOLITAN-VICKERS ELECTRICAL CO., LTD., Trafford Park, Manchester, 17, is rated at 60 kVA and is capable of delivering a secondary output of 20,000 A.

To avoid the risk of collapsing the projections before the weld is completed the mechanical pressure, which is applied by means of an air cylinder, is adjustable between 600 and 2,000 lb. by means of a reducing valve while the directly calibrated gauge on the top of the cylinder gives a direct reading. The valve is interlocked with the electrical circuit by a pressure switch so that power is not switched on until the predetermined pressure is exerted between the platens. By means of two tapping switches a 3:1 ratio between maximum and minimum secondary voltage is provided. In addition the duration of flow of welding current is timed by a thyratron contactor from five to 300 cycles. After the welding has been completed it is not always desirable to remove the pressure immediately, so an adjustable delay period is provided for by a synchronous mechanical timer, the dial of which is clearly visible on the side of the machine.

The mechanical features of the machine have been considered carefully in line with the special requirements of projection welding. The stout fabricated steel frame imparts the extreme rigidity which is so necessary for the correct alignment of the welding tools with the aid of a substantial guide on the sliding head. The tee slots in the top and bottom platens are machined at right angles to permit alignment of any type of tools, while the circular spigot hole in the bottom platen is accurately lined up with a similar hole in the top platen so that the setting up of standard tools provided with a spigot can be accomplished without the services of a skilled toolsetter, and maintained at any position of the lower platen or at any point in the stroke of the machine. The dimensions of the moving parts and platens are kept within reasonable limits by water cooling.

A.R.P. Signs

The new symbol recently authorised by the Ministry of Home Security for indicating public gas-cleansing centres has been incorporated as an addition to the range of A.R.P. signs supplied by the GENERAL ELECTRIC CO., LTD., Magnet House, Kingsway, London, W.C.2, all of which are made strictly in accordance with BS/ARP.32.

Heater for Air-raid Shelters

A radiator that has been specially designed for warming air-raid shelters by HEATRAE, LTD., Norwich, is made of steel and finished in brown enamel. It is preferably fitted horizontally low down on a wall, for which purpose fixing lugs for four corner screws are provided, with provision for conduit entry at the top or bottom when inverted. Very little space is occupied, since the projection is only 3½ in. and the height 6 in., while the widths are 14, 20 and 26 in. for 500, 750 and 1,000 W loadings.

An important feature is that although the heater's dimensions are so small, no parts that can be touched will reach an uncomfortable

Heatrae shelter heater

temperature. A front plate protects the radiating fins, which are vertical to promote air circulation. The elements are divided into two portions to facilitate two- or three-heat control by switches fitted away from the heater.

Prospects in Peru

Advice for British Manufacturers

From a South American Correspondent

AS in other South American countries, Peru's development has been due in large part to the pioneer work of British capitalists and engineers, the total amount of British capital invested in Peru being estimated at around £30,000,000 sterling. British commercial ties with Peru, therefore, have always been of an intimate nature, but, as in the case of the neighbouring Republic of Chile, for some years before the present war Germany penetrated deeply into the import markets through "compensation" trading. Between the years 1932 and 1938, the percentage of Peru's total imports represented by German goods rose from 9 to 20 per cent., whereas during the same period imports of British goods fell from 17 to 10 per cent.

The whole situation, however, has been altered by present hostilities in Europe, and the consequent blockade of Germany. Thus, during the year 1940 British goods continued to represent nearly 10 per cent. of Peru's imports, whereas German goods had shrunk to the negligible proportion of 1½ per cent. In Peru, however, as in other South American countries, the United States has benefited substantially by Europe's supply difficulties, and imports of American goods in 1940 represented about 63 per cent. of Peru's total imports against 34 per cent. in 1938.

Although present circumstances militate against trade with Peru regard must be paid by British manufacturers to post-war possibilities

Again as elsewhere in South America, there is keen sympathy with the Allied cause in the present war, so that, despite wartime difficulties, Gt. Britain should be able to prepare the ground for substantial trading expansion when international conditions return to normal.

A national census taken in June, 1940, gave the population of Peru at over 7,000,000, so that it is the fourth most populated country of South America. The total area is over 482,000 sq. miles, and the country is rich in natural resources, both agricultural and mineral because of the varied physical features, ranging from the fertile valleys on the coast to the high mountain ranges of the Andes. The chief agricultural product is cotton, followed by sugar and many other products, whilst there are also important livestock, wool and forest industries. Mineral resources include petroleum, copper, gold and silver, lead, zinc, vanadium and bismuth, whilst there are large deposits of hematite iron as also of coal, much of which is still unexploited.

During the past few years, the Government has actively pursued a programme of public works, particularly transport and irrigation, and has built many roads to open up the country's mining resources. Production and export of precious and base metals, as well as petroleum, have continued to expand. Out of total exports in 1940 of 405,814,000 soles (26 soles = £1 sterling) exports of copper represented about 75,000,000 soles, gold bars 24,000,000 soles, other metallic minerals, ores and concentrates, 45,000,000 soles, petroleum and by-products, 100,000,000 soles, raw cotton 71,000,000 soles, sugar 43,000,000 soles, and wool 20,000,000 soles.

Unlike other Latin American countries, Peru has been very fortunate in disposing of her surplus products, and, so far, no Government assistance has been required in order to deal with difficulties arising from the present situation. As already mentioned, total exports rose in 1940 to 405,814,000 soles from 381,421,000 soles in 1939, and, with imports at 318,739,000 soles against 255,787,000 soles, the country continues to record a large favourable trade balance, which explains the absence of restrictions in the foreign exchange market—an unusual phenomenon in South America. Export trade continues to run at record levels, the total for the first half of 1941 having been 245,359,000 soles against 200,763,000 soles in the corresponding period of 1940, with imports at 153,767,000 soles against 160,952,000 soles.

In view of the intensive development of mining and means of transport, it is not surprising that Peru's principal import item is "machinery and vehicles," the total value in 1940 being 64,716,000 soles and for the first half of 1941, 34,112,000 soles. The values of imports of other leading items in 1940 were as follows:—Metals and manufactures, 39,984,000 soles; chemicals and pharmaceutical products, 24,824,000 soles; paints, oils, etc., 23,368,000 soles; and electrical material 12,399,000 soles.

The total was made up by the following items, the corresponding figures for the first five months of 1941 being also given in parentheses:—Transmitting and receiving apparatus, telegraphic and telephonic, 1,912,637 soles (856,794); wire and cable, etc., 2,401,312 soles (500,819); transformers, dynamos, motors, galvanometers, etc., 1,327,070 soles (706,046);

electric light bulbs, 894,606 soles (373,729); switchboards, 669,252 soles (97,164); refrigerators and spare parts, 651,143 soles (558,700); accumulators and spare parts, 718,762 soles (291,801); electrical accessories such as plugs, switches, fuses and handlamps, 872,479 soles (390,079); heating apparatus, 925,664 soles (222,353); insulating material, etc., 407,929 soles (160,906); electric light meters (domestic), 293,754 soles (90,299); valves (for radio), 214,632 soles (53,112); lighting apparatus and accessories, 54,207 soles (50,003); carbons, arc-lamps and parts, 123,967 soles (37,158); hand-tools, 70,754 soles (41,979); other electrical goods, 860,789 soles (272.583).

Industrial Progress

Local industries have made great advances in recent years in both productivity and quality, assisted by heavy tariff duties. As elsewhere in South America, this tendency is likely to be intensified by wartime difficulties in obtaining manufactured goods from Europe. A permanent exhibition of Peruvian industries in Lima helps foreign industrialists and commercial travellers to assess their chances of competing with local products. Peru's chief local industry is the manufacture of cotton and woollen textiles, shoes, etc., but there are also turned out annually some 600,000 tons of Portland cement. A committee was recently appointed to promote a company for the installation of a plant capable of producing 80 tons of cement per day in order to supply the needs of Southern Peru. Among many other industries may be mentioned bricks and tiles; nails and screws; hardware; paints, colours and varnishes; and aluminium ware.

Water-power resources are estimated at 4,500,000 HP; at the present time there are about 65 generating plants in Peru, of which 33 derive their power from water. The productive capacity of all domestic plants in Peru in 1938 was approximately 800 million kWh per annum, of which 50 per cent. was used. A hydro-electric plant which supplies light and power to Lima and the Rimac Valley was inaugurated in 1938. There is an increasing demand for wireless sets. Broadcasting services have been established in Lima and Arequipa; they are operated by one official and several privately-owned stations. Reception from abroad is, on the whole, very satisfactory but is subject to atmospheric disturbance on medium and long waves. Air transport is making great progress, as well as road building, despite the mountainous character of the country, and although the normal roads are not metalled, they are generally suitable for motors.

It is understood that negotiations are proceeding between the United States and Peru with a view to the participation of the Export-Import Bank of Washington in a scheme to develop the Peruvian iron and steel industry, which would require financing to the extent of some $20,000,000.

Peru should be favourably affected by the progress reported from Washington under the plan for the United States to obtain deliveries of the bulk of strategic war materials produced in Latin America to the detriment of the Axis powers. Under this plan Peru is expected to make available to the United States her entire supply of copper, lead and vanadium.

With regard to opening up business connections in Peru, the remarks regarding various South American countries dealt with in recent issues of the ELECTRICAL REVIEW also apply fully to Peru. Representation by good agents or other means is of primary importance, whilst sources of advice include the trade's Export Group, the Department of Overseas Trade, Chambers of Commerce and banks established in the country. It must be reiterated that, as in all South American countries, prices must be fully competitive, whilst catalogues, etc., must be drawn up in Spanish, and the metric system employed in quotations.

The unit of currency is the *sole* divided into 100 *centavos*. Exceptionally in Latin America, there is no official exchange control in Peru. However, as in the case of other South American countries, a Payments Arrangement has been made with the British Government and the rate of exchange for payments through the relative Special Account for imports from the sterling area is at present fixed at 26.16 soles per £. Under an Export of Goods (Control) Order of February 19th, 1941, all shipments from Great Britain to Peru require a Board of Trade export licence.

Trading Relations

The whole question of trading relations between Peru and Great Britain has been studied in Peru with sympathetic consideration, particularly as Gt. Britain is usually the chief market for Peruvian cotton. At the same time, the buoyancy in Peru's export trade, and particularly of strategic materials, such as copper and other metals, is due to the large demand from the United States, which is leading to the accumulation by the Central Bank in Peru of a substantial amount of dollars. Such dollars, however, cannot be used for cancellation of sterling commitments, as such procedure would not be consistent with the terms of the Anglo-Peruvian Payments Arrangement.

In brief, United States currency cannot be arbitraged in payment for British goods, and the supply of sterling is therefore largely dependent upon British cotton purchases. The latter were made rather late in the past season, but have sufficed to ease a somewhat stringent sterling exchange position which had arisen. A large proportion of trade with Peru is conducted by means of documentary bills sent through a bank for collection, although Peruvian importers frequently open letters of credit which permit payment to be obtained against documents in London.

Domestic Load Development

Maximum Demand and Load Factor

By P. Schiller

FACED with the gigantic task of building millions of new homes, engineers in this country will have to reach agreement as to the most economic and advantageous ways of supplying domestic energy. So far as electricity is concerned, publications and discussions reveal a striking divergence of views. This state of affairs is due chiefly to the scarcity of reliable information about the characteristics of the load produced by intensive domestic electrification, so that conclusions are often based not on exact data of general validity, but on conjecture, and are thus dependent on the temperament and perspective of the individual contributor.

The author maintains that a group load factor of 60 per cent. is essential if intensive domestic electrification is to prove successful

While in many other countries electrical engineers are more or less agreed that the domestic thermal load (created by electric cooking, water heating and space heating) can be developed economically only so long as it does not materially burden the system peak, there exists here a school of thought which is satisfied that given low tariff rates to encourage the universal use of electricity in the house, all will be well, particularly if consumers are induced by propaganda and hire or hire-purchase facilities, to do everything and anything by electricity, even without departing from common types of appliances and ways of using them. Experience of recent cold snaps has led to certain hesitations regarding radiators, especially their hire and hire-purchase, but thousands of chain stores and other shops all over the country are still displaying and selling radiators priced at a few shillings.

There exists, of course, a possibility that conditions in this country are peculiar, but it would almost appear as if, compared with most of the industrialised Continental countries, they were more unfavourable, inasmuch as a relatively moderate and equable climate indulges in occasional excesses of frost. However, pending the publication of comprehensive research data, guessing must continue.

In its admirable Report on Electricity Distribution the McGowan Committee recommended the general adoption of domestic two-part tariffs, with the ultimate aim of a universal running charge of ½d., which was considered "sufficiently advantageous for the consumer to encourage the use of electricity for practically all domestic purposes." At the outbreak of war a running charge of ½d. or less was already available to over half of the total number of domestic consumers in this country, and it was predicted that this facility would soon be extended to everyone. Whether and to what extent this was economically feasible as regards supply undertakings, however, cannot be established beyond dispute, until more is known about the real character of the domestic thermal load so created.

As matters stand now, the position of the individual undertaking depends, roughly, on whether it (1) purchases its whole energy requirements under a grid tariff, or (2) belongs to the privileged classes of owners of selected or phantom stations, and whether its load is (*a*) preponderatingly domestic or (*b*) mixed. The majority of undertakings come under (1), and the high-voltage side of their cost calculations is determined by the grid tariff. A considerable proportion of these undertakings serve a preponderatingly domestic load, which means that subsidising the latter from other sources of revenue is virtually out of the question. In what follows it is supposed that the domestic load must be self-supporting, and with this

TABLE 1.—Overall cost per kWh of grid energy.

Annual load factor, per cent.	Cost of high-voltage energy per kWh sold, pence	Remark
20	0.78	
30	0.62	"Developed" domestic loads
40	0.53	
50	0.48	
60	0.45	
70	0.43	

TABLE 2.—Revenue from a domestic two-part tariff.

Annual consumption	Revenue		Remarks
	Annual	Per kWh	
kWh	£ s. d.	d.	
2,000	7 3 4	0.86	Cooking
4,000	11 6 8	0.68	Water heating
6,000	15 10 0	0.62	Space heating
8,000	19 13 4	0.59	
10,000	23 16 8	0.57	
12,000	28 0 0	0.56	

qualification the conclusions are applicable also to undertakings with mixed load, particularly if the times of maximum demand of domestic load and industrial power load coincide, as is the trend to-day.

Table 1 gives the approximate overall cost per kWh (sold) of energy purchased from the grid under a typical pre-war tariff, the fixed-charge component being assumed to work out at £3 5s. per kW of maximum demand, and the running charge at 0.26d. per kWh, while distribution losses are estimated at 10 per cent.

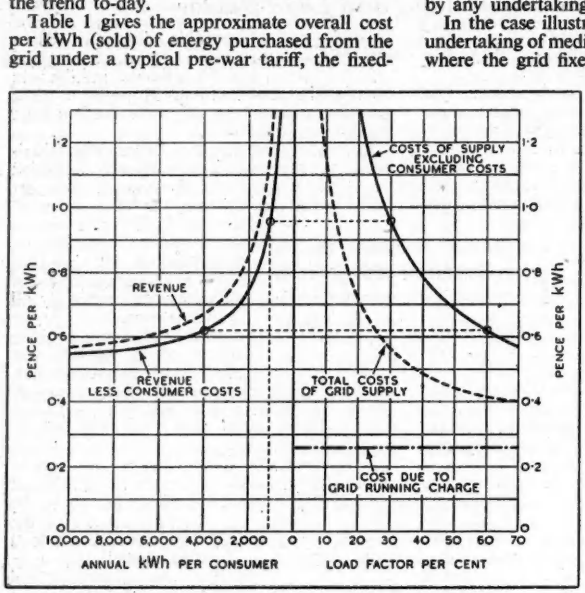
In Table 2 the revenue obtained from the supply of a dwelling under a domestic two-part tariff with an assumed fixed charge of £3 per year, and a running charge of ½d. per kWh is illustrated.

Consumer Diversity

From a comparison of the two tables it would appear that with an undertaking load factor of 30 per cent., which has so far proved characteristic of developed domestic loads, a consumer taking slightly more than 6,000 kWh a year would be charged an overall price per kWh equal to the purchasing cost of high-voltage energy from the grid, *i.e.*, the undertaking would "give away" its service.

However, in order to form a clearer picture, consumer diversity must be taken into account, the most convenient way being to regard group performance. It must also be considered that intensive domestic electrification will lead to a considerable increase in plant capacities. In framing the grid tariffs the Central Electricity Board anticipated that it would ultimately be possible to charge £2 15s. per kW of undertaking maximum demand, but as this rock-bottom limit is preceded by higher steps, beginning with £3 10s., it is obvious that an overall figure of £2 15s. can never be attained by any undertaking.

In the case illustrated it is assumed that an undertaking of medium size has reached a stage where the grid fixed charge works out at £3 per kW. It is further assumed that the running charge is 0.25d. per kWh, which appears optimistic. As to the costs of distribution, it is assumed that these can be divided into a component proportional to the collective maximum demand on the system, say £4 per kW, and a component proportional to the number of domestic consumers connected, say £1 per consumer per annum. It will be appreciated that this way of apportioning costs of distribution favours two-part tariff consumers, and that a figure of £4 per kW of maximum demand is considerably below the present average, thus anticipating particularly propitious future development. Finally, it is assumed that only 7.5 per cent. of the kWh purchased is lost in distribution.



Analysis of revenue and costs of supply

The right-hand portion of the graph shows the resulting costs, excluding consumer costs, per kWh (sold) plotted against load factor. On the left the mean revenue per kWh sold to a group of domestic consumers supplied under a domestic two-part tariff resulting in an average fixed charge of £3 per consumer, with a running charge of ½d. per kWh, is plotted against average annual consumption per consumer (dotted curve). Considering that intensive domestic development has so far not been intended to stop at the £25 to £30 rateable value house, an average revenue from a fixed charge of £3 per consumer appears ample with regard to pre-war tariff rates.

The other curve gives revenue less the above-mentioned fixed costs of £1 per consumer, and its ordinates can be related to that portion of the costs of supply which is a function of load factor.

It will be observed that so long as the load factor calculated on the contribution of the group load to the system peak does not exceed 30 per cent., the average consumption per

domestic two-part tariff consumer must not exceed 1,000 kWh a year if revenue and costs are to balance. If intensive domestic development resulted in an average annual consumption of 4,000 kWh per domestic two-part tariff consumer, this would have to be accompanied by an increase in effective load factor to 60 per cent. Should it, however, turn out that development on traditional lines was unable materially to raise the effective load factor above 30 per cent., the revenue would just cover the cost of grid supply.

In order to prove their case the advocates of intensive domestic electrification on more or less pre-war lines would thus have to show that the all-electric houses envisaged by them would produce a group-load factor of *at least* 60 per cent., considering that the average consumption of all-electric houses is likely to be well above 4,000 kWh per year, and that the assumptions on which the graph is based are rather on the safe side. The group-load factor must be taken, because the incidence of the collective peak of the load produced by such houses would determine the incidence of the undertaking peak.

If this proof cannot be supplied, general reorientation will be indispensable, for which the crystallising points will be delimitation of aims, thermal-storage, and load control.

Detecting Incendiary Bombs

A Review of Electrical Means

IN our issue of February 28th last we reviewed a Memorandum on "Fire-Detection Devices with special reference to the Detection of Incendiary Bombs," which was published by the Institution of Electrical Engineers. Much of its matter, with additional details, has been incorporated in a recent Bulletin (C.22) issued by the Ministry of Home Security. It is now emphasised that an alarm-bell circuit must be operated from a separate regularly inspected battery. Normally the alarm-circuit switch closes when the detector operates.

Light-operated Devices

Light-sensitive detector systems (BS/ARP. 60) should be installed under the supervision of specialist firms. Heat-sensitive detectors (BS/ARP. 53) in the simplest form consist of a switch with contacts held apart by paraffin wax with a stable melting point between 130 and 155 deg. F. Contacts must be kept clean and the melted wax must not flow towards them to form an insulating layer; in one device 42 V was required to cause an ordinary bell to ring instead of the 3 V necessary when new. The circuit should be tested daily.

Alternatively the detector contacts can normally be closed by wax, current flowing continuously; when the wax melts due to extraneous high temperature, a relay closes the alarm circuit. As breakage of any part of the detector circuit gives the alarm, supply may be taken from the mains, although an alternative (*i.e.* battery) supply should be available. A battery for the detector circuit would be of large capacity compared with that of the battery necessary in all cases for the alarm circuit.

In order to keep the alarm circuit open while the current is flowing through the detector circuit, the relays are of the "hold-off" type. Pressure on the alarm-circuit contacts when the relay is released should be at least ¼ oz. Platinum or platinum-gold-silver alloy (7 67 and 26 per cent.) should be used for al contacts.

Thermal Types

Heat-sensitive detectors should be placed in the roof space or in the rooms immediately below. One unit is required per small room or per 100 sq. ft. of floor area at ceiling level. The switch of an alarm circuit may be operated by the breaking or pulling of a net or cable resulting from the impact of a bomb or by burning. With a closed electrical circuit strung to and fro across the protected space, the system should function primarily from impact, burning being a secondary defence (BS/ARP. 55). As ordinary soft copper wire would stretch without breaking, hard-drawn wire of 30 s.w.g. (which would break without undue stretching) should be employed—about 1 yard per sq. ft. of area covered. If erected in hot weather a sag of about 4 in. should be allowed in a 15 ft. span (the maximum length without fixed support) strung at not less than 2 ft. above the floor.

In another system, which requires current only in the alarm circuit, a taut cord normally holding a spring-operated switch in the "off" position is ruptured or burned through. Spans should be not more than 4 in. apart and close to the roof. A switch of the tumbler rather than of the knife type is recommended as its contact surfaces are less likely to become tarnished.

Regarding proposals for operating a switch for an alarm circuit as a result of the weight of a bomb causing two layers of wire netting to touch, experiments have shown that a falling incendiary would probably perforate the netting with very little deflection. Such a scheme would, therefore, be unreliable.

COMMERCE and INDUSTRY

Fuel Economy Suggestions. Developing Australian Exports.

Select Committee and Fuel Saving

MEANS of conserving fuel resources are dealt with in the twenty-fourth report of the session from the Select Committee on National Expenditure. The Committee considers that the aid of the B.B.C. should be enlisted in two forms. First, the Corporation should give frequent publicity to the subject of fuel economy and secondly a saving could be effected by shortening the hours of home broadcasting.

The Committee stresses the need for a reduction in the use of electricity between the hours of 8 a.m. and noon on weekdays as the heaviest needs of industry occur during this period. It is considered that greater efforts should be made by the Mines Department in conjunction with the electricity and gas industries to secure voluntary savings by consumers. Although it is necessary to have ready a rationing scheme, attention is drawn to the practical difficulties of enforcing such a scheme. In fact the Committee says that while coal, coke and paraffin supplies can be rationed, it is exceedingly difficult, if not impossible, to devise a satisfactory scheme for rationing gas and electricity. The report also deals with the question of labour in the mines and recommends consideration of the release of miners from the Services and other industries.

Another point with which the Committee deals is the importance of making the most economical use of raw coal. In this connection it is pointed out that since the by-products of coal are essential for explosives the fuller use of gas for domestic purposes might well justify encouragement.

Scheduling of Supply Undertakings

It was revealed in a report presented at yesterday's meeting of the London and Home Counties Joint Electricity Authority that the Ministry of Labour has extended the period for the scheduling of electricity supply undertakings under the Essential Work (General Provisions) Orders to March 23rd, 1942.

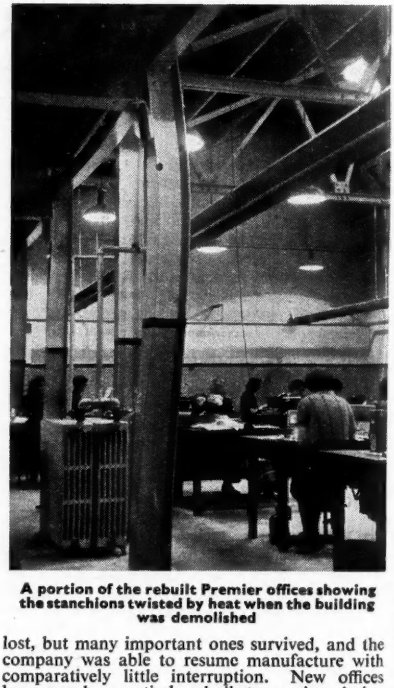
The Authority has received a provisional certificate of registration of its departments or branches carrying out general building or civil engineering work.

Incendiary Bomb Precautions

The Ministry of Home Security is issuing a leaflet entitled "Structural Precautions against Incendiary Bombs," calling attention to the urgent need for buildings to be made more resistant to incendiary attacks. Among the main recommendations contained in this leaflet will be the clearance from top storeys or roof spaces of all combustible stocks and the treatment of roof timbers with fire resistant materials. In addition, the leaflet gives advice on how to make roofs as impenetrable as possible and descriptions of the various fire retarding materials and paints available and the methods of using them. The Ministry of Home Security urges occupiers of business premises, particularly warehouses, departmental stores and multi-storey factories, to carry out at once the necessary work, and reminds them that compulsory powers under the Defence Regulations will be used if the need should arise. The leaflet will be distributed through the factory inspectors and trade associations, but if there is any difficulty in obtaining a copy from these sources application may be made to the Publications Department, Ministry of Home Security, Horseferry House, Thorney Street, London, S.W.1 or the Scottish Home Department, St. Andrew's House, Edinburgh, 1.

New Premier Offices

Some months ago the offices of Premier Electric Heaters, Ltd., were very seriously damaged by H.E. and incendiary bombs. Certain records were lost, but many important ones survived, and the company was able to resume manufacture with comparatively little interruption. New offices have now been entirely rebuilt to wartime design so that when we looked round the buildings a few days ago there was surprisingly little evidence of the previous havoc. A few twisted steel stanchions and girders, still in service in the offices, stood as rather grotesque reminders of the enemy's visit.



A portion of the rebuilt Premier offices showing the stanchions twisted by heat when the building was demolished

Egyptian Import Restrictions

The Egyptian Government has published a proclamation imposing restrictions on certain goods imported into Egypt during the period

November, 1941, to April, 1942. Included in the list are uninsulated copper and steel cables, imports of which are restricted to 180 tons, batteries and accumulators (350 tons), and insulated cables, not subterranean or submarine (300 tons).

Chief Engineers' Salaries

Clitheroe Town Council has decided not to adopt the scale of salaries agreed upon by the National Joint Committee of Local Authorities and Chief Electrical Engineers.

Australian Electrical News

An Australian correspondent writes:—It is difficult to foresee the nature of trade conditions after the war, but it is evident even at this stage that an export trade must be fostered if the Australian electrical manufacturing industry, brought to such a high pitch by war production, is not to languish. An Export Development Group was established recently in Sydney with the object of fostering Australian export industry as a whole and electrical manufacturers interested are invited to become members. Membership will entitle them to general assistance and advice on all matters relative to export trade. Market readily accessible are the Netherlands Indies, Malaya, India, and South Africa, and inquiries for electrical goods have already been received from these countries.

Contracts exceeding £44,000 in value have recently been received from the State Electricity Commission of Victoria by the British General Electric Co. Pty., Ltd., for manufacture in the various works of the General Electric Co., Ltd., England. These include 6,600-V metal-clad substation switchgear; over 12 miles of 22-kV Pirelli-General paper-insulated armoured cable; a number of 322-HP, 6,600-V slip-ring motors for driving briquette presses, and a large number of Chamberlain and Hookham polyphase two-rate kWh meters.

Our Perth correspondent reports that an order which came into force last month prohibits the sale or offer for sale in Victoria of electric lamp fittings and attachments (including shades, screens and reflectors), consisting of or containing celluloid produced from pyroxylin (cellulose nitrate), without the express approval of the State Electricity Commission.

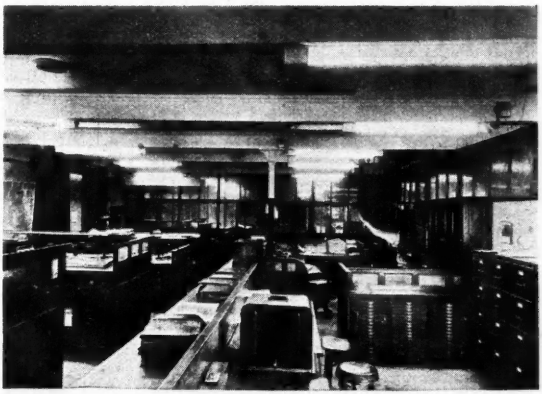
Kettles and Saucepans

With reference to the note in the ELECTRICAL REVIEW of October 24th relating to the Board of Trade licence making available a larger supply of kettles and saucepans, it is pointed out that the appliances concerned are non-electric.

Reading-lamp Fatality

An inquest was held last week at Beckenham Town Hall on Mrs. Beatrice Ellen Page, aged sixty, wife of Lieut.-Col. the Rev. C. A. S. Page, rector of West Wickham. Mrs. Page received a fatal electric shock from an all-metal table lamp in her bedroom at Coney Hall Rectory, on Friday night, October 17th.

During the proceedings, Mr. Owen Penfold, district mains engineer to the West Kent Electric Co., Ltd., stated that he had examined the reading-lamp and found that an intermittent fault in the lampholder was due to a piece of the porcelain interior having broken off. This permitted a connection screw to come into contact with the metal holder and charged the metalwork of the lamp at the full mains voltage. He stated that the lamp might be switched on and off a number of times without causing a shock, but it was possible that movement of the lamp stand might cause the screw to make contact. He thought that the lamp, which was of an old-fashioned type and had not been much used, might have been dropped at some time. It had been rewired about five years ago.



An example of general office lighting by means of "Mazda" 80-W fluorescent lamps

It was stated that artificial respiration was applied by the rector and later by two auxiliary firemen under the doctor's direction, but without success. The coroner recorded a verdict of "Accidental death."

Prices of Second-hand Goods

Colonel H. B. Spens, chairman of the Price Regulation Committee for the South-west of Scotland Region, stated in Glasgow on October 29th that trading in second-hand articles, such as wireless sets, vacuum cleaners, electric cookers and heaters, had given the Committee much concern, as these appliances were being sold at prices beyond their original retail cost, and many of them were liable to break down when used. Although no guarantee was given, Colonel Spens added that purchasers no doubt had the right at common law to reject such appliances and claim the refund of their money. But many people were not prepared to spend the time and trouble involved in litigation. It was right that the public should be warned against the buying of such appliances at excessive prices with the risk of their proving inefficient and useless. To deal with this abuse the Committee had asked the Board of Trade through the Central Committee

to make an Order requiring all second-hand dealers to be licensed, and to limit the prices of second-hand articles to not more than the price of a similar first-hand article.

The Committee is also urging the registration of all wholesalers in order to stop multiple transactions in various goods before they reach the public at exorbitant prices.

Restoration of Patent

An Order was made on October 23rd under Section 20 of the Patents and Designs Acts, 1907 to 1939, restoring Patent No. 393120 of August 3rd, 1931, and granted to Otto Ballert and Erhard Wendt for an invention entitled "Improvements in wire covering machines."

Quicker Turn-round of Vehicles

A national campaign for securing a quicker turn-round of all classes of railway wagons, vans, lorries, barges and canal boats was inaugurated last week by the Minister of War Transport, Lord Leathers. About 40 per cent. of the time of a round trip, he said, was taken up at the ends. It was this period where it was hoped that a considerable saving of time could be effected in order to secure the greatest possible use of wagons and lorries, of which, to meet all demands, at least 100,000 more were required but were not forthcoming owing to the need for making aeroplanes, guns and tanks instead. Traffic was, of course, becoming heavier due to the expansion of the war industries, and, furthermore, transport undertakings were severely handicapped by the black-out restrictions and the calling up of workers (more than 100,000). Much was being done by the Ministry to improve facilities in every way possible and everyone concerned was asked to co-operate in the campaign, for which the letter "Q" had been adopted as a symbol, not only by saving time on the turn-round but also by seeing what could be done in the way of rationalising the distribution of goods.

Engineering Wages Claim Rejected

A claim made by the Amalgamated Engineering Union and the foundry workers for an advance of 4d. per hour on basic rates (or 16s. a week) was rejected by the Engineering and Allied Employers' Federation last week. It is expected that the matter will now be submitted to the National Arbitration Tribunal for settlement.

Electrical Appliance Prices

Referring to the note in our last week's issue, page 480, we should like to make it clear that the term "domestic electrical appliances" (for which the Central Price Regulation Committee has approved the current prices) *i.e.*, pre-war list prices plus 33⅓ per cent.) is intended to cover only the items included in the schedule for heating, cooking and domestic appliances and *not* those in the schedules covering electric wiring appliances and electric bells, indicators and bell materials.

Municipal Trading at Horsham

Horsham Urban District Council has referred back a resolution by the Electricity Committee favouring a policy of direct trading with the public, on the expiry of the agreement with the local electrical contractors.

New Catalogues and Lists

British Thomson-Houston Co., Ltd., Crown House, Aldwych, London, W.C.2.—A message to works managers explaining how B.T.H. "light conditioning" will increase production in small press shops.

Cooke & Ferguson, Ltd., Victoria Street, Openshaw, Manchester.—A revised brochure dealing with welded storage tanks, condenser shells, transformer and switchgear tanks, instrument panels, kiosks, stator frames, fabricated machine tools, etc.

W. T. Henley's Telegraph Works Co., Ltd., Milton Court, Westcott, Dorking.—New edition of catalogue W.A.5, detailing dwarf type unit distribution pillars and panels.

Murex Welding Processes, Ltd., Hertford Road, Waltham Cross, Herts.—Illustrated leaflet (M. 20) describing the arc welding of copper and its bronze and brass alloys.

English Electric Co., Ltd., Stafford.—Illustrated leaflet (Z13) concerned with cubicle-type switchgear for low and medium voltages and indoor service.

British Insulated Cables, Ltd., Prescot, Lancs.—Illustrated leaflet (N.S.C.7) dealing with non-bleeding "sandwich" type cables.

Compound Electro Metals, Ltd., 42, Pall Mall, London, S.W.1.—Illustrated technical brochure dealing with special alloys for switchgear contacts and welding electrodes.

Thorn Electrical Industries, Ltd., 105–9, Judd Street, London, W.C.2.—A new price list of "Atlas" lamps.

Change of Address

Morris Ashby, Ltd., metal merchants, have removed to 95, Gresham Street, London, E.C.2 (telephone: Kelvin 2033-6).

TRADE MARK APPLICATIONS

THE following applications have been made for British trade marks. Objections to any of them may be entered within one month from October 29th.

PANAMUSE (design). No. 614,342, Class 9. Wireless and television instruments and apparatus, sound recording and sound reproducing instruments and apparatus, and component parts. Farnsworth Television & Radio Corporation, 3,700 East Pontiac Street, Fort Wayne, Indiana, U.S.A. Address for service: c/o Stevens, Langner, Parry & Rollinson, 5–9, Quality Court, Chancery Lane, London, W.C.2.

VIDA. No. 615,959, Class 17. Insulating material, electric insulating sleeving, insulators and parts thereof, insulation parts of electrical equipment; and threads, cords, tape and braid, all composed wholly or mainly of indiarubber: and jointing packings. VIDAFLEX. No. 615,960, Class 17. Insulating material, insulators and parts thereof, insulation parts of electrical equipment; threads, cords, tape and braid, all composed wholly or mainly of indiarubber; and jointing packings. Jones, Stroud & Co., Ltd., Vida Mills, New Street, Long Eaton, Derbyshire.

ELECTRICITY SUPPLY

Cheltenham's Protest. *B.O.T. Bans Eccles Increase.*

Bilston.—LIGHTING SCHEME.—Consideration is being given by the Town Council to the question of installing modified street lighting.

Birkenhead.—LOAN FOR MOTORS.—The Electricity Committee is seeking sanction to borrow £500 for electric motors for hire.

Cheltenham. — PYLONS AND AMENITIES. — Recently the town clerk was instructed to write to the Central Electricity Board protesting against the amenities being spoilt by the bad siting of pylons (ELECTRICAL REVIEW, September 12th). At the last meeting of the Highways Committee a letter was read from the C.E.B. to the effect that it was under no statutory obligation to consult any town planning committee, but partly because of the picturesque country and partly out of courtesy it went out of its way to consult the Gloucester county planning authorities, and the Board could not undertake to make any alteration at some future date to meet the Highways Committee's views. The Committee expressed the opinion that in the interests of good planning and the preservation of amenities the Minister of Works and Buildings should be asked to include in the next Town Planning Bill a clause requiring Government departments and statutory bodies to consult with planning authorities.

ECONOMY IN PARAFFIN.—At the same meeting the Committee considered a memorandum from the Ministry of War Transport drawing attention to the need for the utmost economy in the use of paraffin oil and expressing readiness to approve of paraffin lamps on traffic obstructions being replaced by electric lamps where the installation could be provided without additional expense, taking into account the savings in labour, oil, etc. The town clerk stated that he had discussed the matter with the borough electrical engineer and found that 56 lamps on islands, refuges, etc., could be conveniently replaced by electric signs at a cost of £68 with a maintenance cost of £84 per annum. The present cost of maintaining the oil lamps was £170 per annum and there would be considerable saving in the employment of labour outside normal working hours. The Committee therefore agreed to the scheme being carried out.

Clydebank.—MODIFIED LIGHTING.—The Town Council has agreed to the provision of modified street lighting in a number of streets, and a report is to be prepared on the extension of such lighting throughout the burgh.

Eccles.—PRICE INCREASE "NOT JUSTIFIED."—In connection with the proposal to make a temporary war increase in charges of 5 per cent., it was recently reported to the Electricity Committee that the Electricity Commissioners had referred the matter to the Board of Trade, which was unable to regard the proposal as justified by the present circumstances of the Council's undertaking. The Committee is again communicating with the Commissioners on the subject.

RENOVATION OF ALUMINIUM UTENSILS.—The borough electrical engineer reported that difficulty was being experienced in effecting repairs to aluminium utensils used with electric cookers supplied on hire owing to the makers no longer being in a position to undertake the necessary renovation. It was decided to purchase a portable grinding and buffing machine at a cost of £21 so that the greater part of the work could be done by the Department.

FRINGE ORDER.—The Electricity Committee has obtained consent from the Stretford and District Electricity Board and the Lancashire Electric Power Co. to apply for a Fringe Order and is seeking sanction to borrow £650 for mains to a new substation.

Northern Ireland.—AMALGAMATION OF ELECTRICITY UNDERTAKINGS?—Our Belfast Correspondent reports that the Corporation Electricity Committee at its last meeting approved a statement drawn up by a sub-committee outlining the course of negotiations between the Committee and the Northern Ireland Ministry of Commerce on the future of the Belfast electricity undertaking, and decided that it should be sent to all members of the Council. At present negotiations have reached a stalemate and a statement is expected shortly from the Ministry of Commerce. A member of the City Council stated last week that he expected that within the next twelve months there would be a merger of all electricity undertakings in Northern Ireland and that the Government would establish a Board to control the amalgamated organisation. The question at issue was largely what controlling interest Belfast Corporation would have in the organisation, and the financial provisions necessary for its realisation.

Water-power in Scotland

FOLLOWING the first meeting of the Scottish Council on Post-war Problems held at Edinburgh it was announced that, on the Council's recommendation the Secretary of State, with the concurrence of the President of the Board of Trade, had appointed a committee to consider the utilisation of water power in Scotland. The terms of reference of the committee are as follows: To consider (a) the practicability and desirability of further developments in the use of water power resources in Scotland for the generation of electricity, and (b) by what type of authority or body such developments, if any, should be undertaken, and under what conditions, having due regard to the general interests of the local population and to considerations of amenity, and to report.

The Committee will sit under the chairmanship of Lord Cooper, the other members being Lord Weir, Mr. Neil Beaton, Mr. James Williamson and Mr. John A. Cameron. Mr. R. McLarty, advocate, 9, Parliament Square, Edinburgh, will act as secretary. Lord Cooper, Lord Justice Clerk, has a wide knowledge of questions relating to hydro-electricity. Viscount Weir of Eastwood, is chairman of G. & J. Weir, Ltd., and was chairman of the Committee on the Supply of Electrical Energy, 1926. Mr. Neil Beaton is chairman of the Scottish Co-operative Wholesale Society, and has wide administrative and business experience. Mr. James Williamson, M.Inst.C.E., was the consulting engineer who carried out the Galloway water power scheme. Mr. John A. Cameron is a member of the Scottish Land Court.

Middlesbrough. — MAINS EXTENSIONS. — The Town Council has received sanction from the Electricity Commissioners to borrow £1,252 for mains.

Oswestry.—RURAL TARIFFS.—The borough electrical engineer (Mr. H. Breckell) is to prepare a report on tariffs for electricity supplies in rural areas.

STREET LIGHTING.—The Council has authorised the provision of lighting at 32 points in the town.

Paisley.—LOAN.—As the borrowing powers sanctioned in respect of mains and services are exhausted the Town Council Electricity Advisory Committee recommends that application shall be made for sanction to borrow an additional £5,000.

Saffron Walden.—OVERHEAD LINES.—The County of London Electricity Supply Co., Ltd., is to erect overhead lines.

Sheffield.—MAINS EXTENSIONS.—The Electricity Committee is to extend mains at a cost of £17,121.

Stoke-on-Trent.—SHELTER LIGHTING. — The Emergency Committee is to purchase lamps and batteries for lighting school shelters at a cost of £1,000

Thorne (Yorks).—MODIFIED LIGHTING.—Being divided on the question of providing modified lighting the Council has decided to leave it to the ratepayers to give a decision for the guidance of the Council.

Walton and Weybridge.—PUMPING PLANT.—The Urban District Council is to spend £200 on electrifying sludge pumping equipment at the sewage works.

Warrington.—SUBSTATION.—The Town Council has approved plans for the erection of a substation.

Willesden.—SATISFACTORY YEAR'S WORKING.—At the last meeting of the Borough Council satisfaction was expressed with the financial results of the year's operations of the Electricity Department. The Council also conveyed to the electrical engineer and manager (Mr. J. D. Spark) and the staff of the Department their appreciation of the work of all grades employed in the undertaking, and the manner in which the service had been maintained during the difficult circumstances of the war.

Wolverhampton.—SUPPLY EXTENSION.—The Corporation Electricity Committee is to provide supply to consumers in the Pelham Street area at a cost of £362.

Worcestershire. — SCHOOL HEATING. — The County Education Committee is to have electric heating installed at Catshill Senior School.

Overseas

United States.—ADDITIONAL GRAND COULEE PLANT.—*Electrical West* reports that contracts have been let for a further three 108,000-HP Westinghouse generators, together with 150,000-HP turbines (Newport News Shipbuilding & Drydock Co.) for the Grand Coulee Dam power house. With the three sets already ordered this will make the total capacity 648,000-kW, scheduled for 1943. It is proposed to install fifteen units by 1945. When the first set underwent tests in July last a bearing burnt out, and during the final tests the starting up of the plant was delayed by the scoring of the main thrust bearing supporting the 802-ton rotor due to operating difficulties with the lubricating system.

TRANSPORT

Glasgow.—DEPARTMENT DEBT-FREE—For the second time in its history the Corporation Transport Department is to clear off the entire amount of its loan debt. It was reported to the Transport Committee recently that the Department was in a position to redeem the net loan debt of £4,880,540. The capital debt will be repaid from sums standing to the credit of the depreciation and renewals fund, which now stands at £5,120,246. An immediate effect of the debt redemption will be an annual saving to the Department of sinking fund charges to the amount of £183,000.

Great Britain.—RAILWAYS AND THE WAR.—It is reported that 280 railwaymen have lost their lives and 1,500 have been injured by enemy action while they have been carrying out their railway duties. In traffic controls and signal boxes emergencies have been met with calmness and exemplary devotion to duty. Electricians, linesmen and platelayers have repaired vital telephone wires, cables and tracks under fire, technicians have examined unexploded bombs, and engine depot and power-house engineers have drawn boiler fires while bombs were dropping all around them.

RADIO & TELEPHONY

Australia.—BROADCASTING EXTENSIONS DEFERRED.—The Commonwealth Director-General of Posts and Telegraphs stated recently that there was no possibility of proceeding at present with the plans of the Australian Broadcasting Commission to extend its system. It was proposed that the A.B.C. should erect seventeen regional and short-wave stations, including two in South Australia and seven in New South Wales. He further stated that when the full chain was operating the revenue (£75,000) would fall short by £24,000 of the total maintenance costs.

The Commonwealth Bureau of Census and Statistics states that during the nine years from 1931 to 1940 the number of factories in Australia manufacturing radio equipment increased from 26 to 73, employees from 908 to 4,869 and the value of output from £560,000 to £2,835,000.

Great Britain.—TELEPHONE REARRANGEMENT.—The Leeds district telephone system has been reorganised and on November 1st 3,000 subscribers in the area had their numbers changed. All sub-exchanges in the area except one have been discontinued and the areas formerly served by these are now included in the Leeds exchange. The new system provides for a fully automatic service between Leeds and subscribers within a range of 15 miles. Three other districts in the Leeds area—Horsforth, Cross Gates and Oakwood—are being converted to the automatic system and the work will be completed in about twelve months.

POLICE RADIO.—Owing to difficulty of obtaining equipment the Cumberland County Council's plans for providing radio equipment for the police force have been postponed.

United States.—TELEGRAPH COMPANY MERGER.—The Senate Inter-State Commerce Committee has unanimously recommended Congress to permit the merger of the Western Union Telegraph and Postal Telegraph Companies. The next step involves the introduction of legislation to carry out the recommendations.—*Reuter.*

FINANCIAL SECTION

Company News. Stock Exchange Activities.

Reports and Dividends

Ferranti, Ltd.—The accounts for the year ended June 30th, which are now published, confirm the figures given in our issue of October 24th. The profit, after providing for tax, is £172,155, as compared with £141,693 for 1939–40, and after deducting depreciation, fees and war damage insurance, the net profit is £79,282 (against £78,159). A sum of £20,000 is again placed to contingency reserve, and the ordinary dividend for the year is maintained at 6 per cent., tax free, the balance carried forward being £74,482 (against £68,200 brought in).

Carron Company reports a profit for the year to June 30th, after providing for depreciation, of £62,719, to which is added £33,920 brought in. It is proposed to place £40,000 to general reserve and to pay a dividend of 10 per cent. plus a cash bonus of 5 per cent., both tax free, leaving £34,139 to be carried forward.

Marconi's Wireless Telegraph Co., Ltd., is maintaining its interim ordinary dividend at 3½ per cent., actual, less tax.

The Marconi International Marine Communication Co., Ltd., is again paying an interim dividend of 2½ per cent., less tax.

Pernambuco Tramways & Power Co., Ltd.—The accounts for 1940 show a loss of £14,780 (against £15,606 for 1939), raising the accumulated deficit to £128,210.

W. T. Henley's Telegraph Works Co., Ltd., have again declared an interim dividend of 5 per cent.

Glenfield & Kennedy, Ltd., are paying an interim dividend of 5 per cent. (same).

Meters, Ltd., has announced an interim dividend of 4 per cent., less tax (against 2½ per cent.).

New Companies

Industrial Mouldings (Warwick), Ltd.—Private company. Registered October 24th. Capital, £3,000. Objects: To acquire the business of a bakelite moulder carried on by W. A. Balfry at Avon Street, Warwick, as "Industrial Mouldings," and to carry on business as makers of mouldings or pressings in bakelite or similar synthetic resins, etc. Directors: W. A. Balfry, 340, Myton Road, Warwick, and two others. Solicitors: Wright, Hassell & Co., 9/11, Dormer Place, Leamington Spa.

Designed Lighting, Ltd.—Private company. Registered October 27th. Capital, £1,000. Objects: To carry on the business of manufacturers and designers of, and dealers in, electric or other lamps, gas and electric light fittings, accessories and appliances, lamp shades, etc. Directors: A. C. Adamson, 106, The Woodlands, North Harrow, Middlesex, and H. G. King, 1, Park Cottages, Billet Lane, Iver Heath, Bucks. Solicitor: E. R. J. Leggett, 6, Serjeants' Inn, E.C.4.

Harding & Co. (Engineers), Ltd.—Private company. Registered October 10th. Capital, £500. Objects: To carry on the business of electrical, mechanical, marine, internal combustion, constructional, radio, television, agricultural and general engineers, etc. Directors: N. Boyd, 2, Chatsworth Crescent, Sunderland; and J. Hutchinson, 8, Woodside Avenue, Corbridge, Northumberland.

Companies' Returns

Statements of Capital

Crypton Equipment, Ltd.—Capital, £1,000 in £1 shares. Return dated July 19th. All shares taken up. £1,000 paid. Mortgages and charges: £53,949 9s.

William Geipel, Ltd.—Capital, £25,150 in £1 shares (25,000 preference, 100 "A" ordinary and 50 "B" ordinary). Return dated July 19th. All shares taken up. £23,650 paid. £1,500 considered as paid. Mortgages and charges: Nil.

Monks & Byrne, Ltd.—Capital, £2,500 in 2,500 shares of £1 each. Return dated May 14th, 1939 (filed July 19th, 1941). 2,000 shares taken up. £1,350 paid. £650 considered as paid. Mortgages and charges: Nil.

Wigtownshire Electricity Co., Ltd.—Capital, £175,000 in £1 shares. Return dated July 21st. 135,000 shares taken up. £135,000 paid. Mortgages and charges: Nil.

Monmouth Electricity Co., Ltd.—Capital £5,0,000 in £1 shares. Return dated July 21st 35000 shares taken up. £35,000 paid. Mortgages, and charges: Nil.

Aberayron & District Electricity Supply & Power Co., Ltd.—Capital, £12,500 in £1 shares. Return dated July 21st. 10,000 shares taken up. £7,002 paid. £2,998 considered as paid. Mortgages and charges: Nil.

Sphere Electrical Instrument Co., Ltd.—Capital, £1,000 in £1 shares. Return dated July 22nd. All shares taken up. £1,000 paid. Mortgages and charges: Nil.

Whitehall Electric Investments, Ltd.—Capital, £7,500,000 in £5,000,000 ordinary stock and £2,500,000 preference stock. Return dated July 23rd. All stock taken up. £2,500,007 paid. £4,999,993 considered as paid. Mortgages and charges: Nil.

Callender's Cable & Construction Co., Ltd.—Capital, £2,300,000 in 1,500,000 ordinary, 400,000 6½ per cent. cumulative preference and 400,000 7½ per cent. "B" cumulative preference shares of £1. Return dated July 25th. 1,123,916 ordinary and all the preference shares taken up. £1,255,000 paid. £668,916 considered as paid. Mortgages and charges: £300,000.

Settle & District Electricity Co., Ltd.—Capital, £100,000 in £1 shares. Return dated July 28th. 75,000 shares taken up. £75,000 paid. Mortgages and charges: Nil.

Herne Bay & District Electricity Supply Co., Ltd.—Capital, £140,000 in £1 shares (all ordinary). Return dated July 23rd. 116,006 shares taken up.

£96,006 paid. £20,000 considered as paid. Mortgages and charges: £27,000.

St. Austell & District Electric Lighting & Power Co., Ltd.—Capital, £120,300 in 30,000 7 per cent. preference stock, £40,000 4½ per cent. preference stock, £50,000 ordinary stock and 300 founders' shares of £1. Return dated July 1st. All stock taken up. £131,720 paid (including premiums of £17,720). £6,000 considered as paid. Mortgages and charges: £27,450.

Weston-super-Mare & District Electric Supply Co., Ltd.—Capital, £215,000 in 40,000 cumulative preference and 175,000 ordinary shares of £1 each. Return dated July 3rd. All shares taken up. £100,000 paid. £115,000 considered as paid. Mortgages and charges: Nil.

East Suffolk Electricity Distribution Co., Ltd.—Capital, £125,000 in 125,000 ordinary shares of £1 each. Return dated April 2nd (filed May 17th). All shares taken up. £125,000 paid, plus £10,000 in respect of premiums. Mortgages and charges: £12,100.

Minehead Electric Supply Co., Ltd.—Capital, £130,000 in 29,000 first preference and 101,000 ordinary shares of £1. Return dated June 12th. All shares taken up. £115,027 paid on 16,000 first preference and 99,027 ordinary shares. £14,973 considered as paid on the remainder. Mortgages and charges: Nil.

Ewell Court Electrical, Ltd.—Capital, £2,000 in 2,000 shares of £1 each. Return dated June 17th. 1,510 shares taken up. £10 paid. £1,500 considered as paid. Mortgages and charges: Nil.

Austinlite, Ltd.—Capital, £6,000 in 6,000 shares of £1 each. Return dated July 23rd. All shares taken up. £6,000 paid. Mortgages and charges: Nil.

Increases of Capital

B. & B. Batteries, Ltd.—The nominal capital has been increased by the addition of £4,900 beyond the registered capital of £100. The additional capital is divided into 4,900 non-redeemable preference shares of £1 each, ranking *pari passu* with the ordinary shares for dividend but having priority for repayment of capital in a winding up.

Anglo-Argentine General Electric Co., Ltd.—The nominal capital has been increased by the addition of £65,000 beyond the registered capital of £65,000. The additional capital is divided into 65,000 non-redeemable " B " preference shares of £1 each.

Broadcast Relay Service, Ltd.—The nominal capital has been increased by the addition of £250,000 in £1 shares beyond the registered capital of £1,250,000.

Mortgages and Charges

Underwood (Electric), Ltd.—Assignment of proceeds of contracts, dated October 8th, 1941, to secure all moneys due or to become due from the company to Martins Bank, Ltd., not exceeding £900. Assignment of proceeds of certain contracts dated October 15th, 1941, to secure all moneys due or to become due from the company to Martins Bank, Ltd., not exceeding £5,400.

Resistances, Ltd.—Debenture, charged on the company's undertaking and property, present and future, including uncalled capital, dated September 30th, 1941, to secure £800. Holder: S. South, New River House, Devonshire Hill, Tottenham, N.17.

Britannic Electric Cable & Construction Co., Ltd.—Further debenture, charged on the company's undertaking and property, present and future, including uncalled capital, dated October 20th (supplemental to debenture dated June 28th, 1938, and further debentures dated October 11th, 1939, and May 15th, 1940), to secure £25,000. Holders: Westminster Bank, Ltd.

Receivers Appointed and Released

G. & L. Electrical Supply Co., Ltd.—A. I. Todman, of Canada House, Norfolk Street, W.C.2, ceased to act as receiver and manager on October 11th, 1941.

British Blue Spot Co., Ltd. (in liquidation).—(*a*) W. K. Fox, Sterling Works, Dagenham, ceased to act as receiver on October 19th, 1941. (*b*) C. H. I. Chown, 47a, Cranbrook Road, Ilford, was appointed receiver on October 19th, 1941, under powers contained in debenture dated March 4th, 1936.

Private Arrangement

F. L. Napier, electrician, 5, School Road, Sale.—The creditors met recently when a statement of affairs was submitted showing liabilities of £588, of which £471 was due to the trade and the balance of £117 to partly secured creditors. After allowing £10 for preferential claims the net assets were £296, leaving a deficiency of £292. It was reported that the debtor had been serving with H.M. Forces for some time and the business had been managed by an employee. Recently creditors had been pressing. After discussing the position it was resolved that the debtor should execute a letter of authority to Harry L. Price & Co., 47, Mosley Street, Manchester.

Bankruptcies

C. G. Spencer, wireless dealer, 425, Killinghall Road, Bradford, lately carrying on business at Conservative Club Buildings, Main Street, Bingley, Yorks.—This debtor applied for his discharge recently at the County Court House, Manor Row, Bradford. The receiving order was made in 1940 and the Official Receiver reported that the creditors had received a final dividend of 2s. 1¾d. in the £. The debtor traded for about 8½ years and during the whole of that time the net profits only amounted to £261. The drawings, however, had been small. The discharge was granted, subject to five years' suspension and the payment by the debtor during the first two years of a sum of £50.

J. K. Thornborough and **E. C. Thornborough,** electricians, carrying on business as J. K. Thornborough & Co., at Crescent Road, Windermere (separate estate of E. C. Thornborough).—First and final dividend of 5s. 4d. in the £, payable on November 14th, at the Official Receiver's Office, 16, Cornwallis Street, Barrow-in-Furness.

Liquidations

Wilkes Radio (Urmston), Ltd.—Winding up voluntarily. Liquidator: Mr. C. Green, 1, Fennel Street, Manchester, 4.

A.F.A. Accumulators, Ltd.—Particulars of debts to be sent by November 26th to the liquidator, Mr. H. Wylie, 32, Old Jewry, London, E.C.2.

STOCKS AND SHARES

TUESDAY EVENING.

STOCK EXCHANGE business comes patchily and erratically. On one day there may be a good deal of trade going on: on the next day, activity slows down. Both investment and speculation are, to a large extent, selective; that is to say, they are directed to certain markets at some particular time, and to others on another occasion. Lately, shipping shares have occupied the centre of the stage, the gilt-edged markets and the speculative departments being somewhat neglected. The demand for gilt-edged stocks shows no sign of abatement, although the competition of the War Weeks effort is not without its effect upon business in the existing securities.

London Electric Transport 2½ per cent. stock has strengthened to 96½ and the prior charge "A" and "B" securities of the London Passenger Transport Board are both better on the week. As for the shares, ordinary and preference, in front rank industrial companies, the "famine" is continually emphasised. To take only one example, Callender's ordinary are now up to 73s. 9d. middle, at which the yield on the money is no more than £4 1s. 4d. per cent.

Price Fluctuations

Murex shares have risen half-a-crown to 90s. on publication of an excellent report, in which the outstanding feature is the amount of money reserved for taxation. This takes £370,000, and fully absorbs the increased profits of the year. The Murex group has now nearly £900,000 allocated to reserves and the financial strength of the company is such that investment continues to buy the shares, although the yield is a modest £4 9s. per cent.

In the group of Home electricity companies, the prices are unchanged throughout; evidence of the market's stability. Amongst the Overseas issues, Tokyo Electric sixes have gone back three points to 32½, by reason of the belligerent attitude assumed by Japan. Speculative activity is noticed in shares of companies such as Electric & Musical Industries: the price of the shares has strengthened to 13s. 3d. E. K. Cole are better at 8s. A. C. Cossor have risen to a similar price. In the armament group, Vickers strengthened a trifle to 16s. 9d. Last week's loss of 10 points in British Electric Traction deferred has been recovered; the price is again 875 middle. Rio 5 per cent. bonds parted from 3 points of their recent improvement, slipping back to 91½.

Transport "C"

The Home Railway market remains in that state of uncertainty which will characterise it until the Government brings forward the war damage legislation that alone can resolve the doubts which at present surround the matter. London Passenger Transport "C" stock changes hands fairly frequently in the neighbourhood of 40, its supporters arguing that at this price, and regarded as a recovery stock, Transport "C" can scarcely be considered dear. The retort to this argument is that other stocks in the Home Railway market afford a better return on the money, and that, during the war, the likelihood of Transport "C" receiving any more than the present-paid 3 per cent. dividend is very improbable.

Post-War Prospects

That better terms could have been secured for the Transport Board when the matter came before Parliament, is a view frequently expressed in the market, and instead of a 3 per cent. dividend, some people think that the Board might possibly have been able to persuade the Government to agree to a 4 per cent. distribution during the period of the war, and one year after. However that might be, the fact remains that the stock is in receipt of no more than 3 per cent., and at 40 this gives a return of 7½ per cent. on the money, comparing with 8 to 10 per cent. obtainable from some of the other junior stocks negotiated in this market. After the war, however, it is thought that the Board's opportunities for expansion will be very great and, as already mentioned, to-day's buyers pin their expectations to such possibilities, regarding this as compensatory for the comparatively modest yield permitted to the stock under present conditions.

General Electric

There are 2,000 General Electric ordinary on offer at 77s. 3d., at which the yield, on the basis of the last-paid 17½ per cent. dividend, is £4 10s. 9d. per cent. The investor who is on the look-out for post-war shares argues that the General Electric for years paid an annual dividend of 20 per cent., and only by reason of war conditions reduced this to 17½ per cent. in the year which ended last March. Reversion to the 20 per cent. rate is so generally anticipated, that buyers are content to accept the reduced yield, and to await the after-war prospects that, it is hoped, will restore the previously-paid dividend.

Cable & Wireless

Cable and Wireless stocks continue to attract a fair amount of interest, but the ordinary rather hangs fire. Some of the many deceased accounts which have recently come to market may have had Cable and Wireless ordinary and preference stocks included in their lists. It is announced that Mr. J. L. Baird, the inventor of the television system which bears his name, and president of the Baird Television company, has been appointed

(*Concluded on page* 521)

ELECTRICAL INVESTMENTS

Prices, Dividends and Yields.

Company	Dividend 1939–40	Dividend 1940–41	Middle Price Nov. 4	Rise or Fall	Yield p.c.
Home Electricity Companies					£ s. d.
Bournemouth and Poole	15	12½	52/6	..	4 15 5
British Power and Light	7	6	26/–	..	4 12 4
City of London	7½	7	25/9	..	5 8 9
Clyde Valley	8	8	37/6	..	4 5 4
County of London	10½	8	35/–	..	4 11 5
Edmundson's:					
7% Pref.	7	7	32/6	..	4 6 2
Ord.	6	6	28/–	..	4 5 9
Elec. Dis. Yorkshire	9	9	40/9	..	4 8 3
Elec. Fin. and Securities	12½	12½	43/9	..	5 14 2
Elec. Supply Corporation	11½	10	43/9	..	4 11 4
Isle of Thanet	2	Nil	9/–	..	—
Lancs Light and Power	7½	7½	33/9	..	4 9 0
Llanelly Elec.	5½	5½	21/6	..	5 2 4
Lond.Assoc.Electric	5½	4½	18/9	..	4 16 0
London Electric	7	7	24/6	..	5 14 3
London Power Deb. Red.	5	5	104	..	4 16 2
Metropolitan	10	8	36/3	..	4 8 5
Midland Counties	8	8	37/6	..	4 5 4
Mid. Elec. Power	9	9	38/9	..	4 13 0
Newcastle Elec.	7	7	27/6	..	5 1 10
North Eastern Elec.:					
Ordinary	7	7	29/6	..	4 15 0
7% Pref.	7	7	32/6	..	4 6 2
Northampton	10	10	44/6	..	4 10 0
Notting Hill 6% Pref. (£10)	6	6	8½	..	—
Northmet Power:					
Ordinary	10	7	35/–	..	4 0 0
6% Pref.	6	6	29/6	..	4 1 4
Richmond Elec.	6	6	22/6	..	5 6 8
Scottish Power	8	8	38/3	..	4 3 4
Southern Areas	5	5	18/3	..	5 9 7
South London	7	7	23/6	..	5 19 2
West Devon	5	5	21/3	..	4 14 1
West Glos.	4½	4½	19/6	..	4 12 4
Yorkshire Elec.	8	8	39/6	..	4 1 0
Overseas Electricity Companies					
Atlas Elec.	Nil	Nil	2/9	..	—
Calcutta Elec.	8*	7*	37/–	..	—
Cawnpore Elec.	10	10	28/9	..	6 19 0
East African Power	7	7	25/9	..	5 8 9
Jerusalem Elec.	7	5	17/6	..	5 14 3
Kalgoorlie (10/–)	7½	7½	13/–	..	5 15 5
Madras Elec.	6*	4*	22/6	..	3 11 1
Montreal Power	1½	1½	25½	..	5 13 2
Palestine Elec "A"	Nil	Nil	17/6	..	—
Perak Hydro-elec.	2½	6	19/6	..	6 3 0
Shawinigan Power	83cts.	90cts.	16½	..	—
Tokyo Elec. 6%	6	6	32½	–3	18 9 4
Victoria Falls Power	15	15	78/9	..	3 16 2
Whitehall Inv. Pref.	7½	7½	15/–	..	10 0 0

Company	Dividend 1939–40	Dividend 1940–41	Middle Price Nov. 4	Rise or Fall	Yield p.c.
Public Boards					£ s. d.
Central Electricity:					
1950–70	5	5	110	..	4 11 1
1955–75	5	5	113	..	4 8 6
1951–73	4½	4½	107	..	4 4 1
1963–93	3½	3½	101	..	3 9 4
1974–94	3½	3½	95	..	3 8 5
London Elec. Trans. Ltd.	2½	2½	96½	+½	2 11 10
London & Home Counties 1955–75	4½	4½	106½	..	4 4 6
Lond. Pass. Trans.:					
A	4½	4½	117½	+1	3 16 8
B	5	5	116½	+2	4 5 10
C	1½	3	40	..	7 10 0
West MidlandsJ.E.A. 1948–68	5	5	108½	..	4 12 0
Telegraph and Telephone					
Anglo-Am. Tel.:					
Pref.	6	6	106½xd	..	5 12 9
Def.	1½	1½	24½	..	6 2 5
Anglo-Portuguese	8	8	15/–	..	10 13 4
Cable & Wireless:					
5½% Pref.	5½	5½	104	..	5 5 10
Ord.	4	4	67	+½	5 19 5
Canadian Marconi $1	Nil	4cts.	5/–	..	3 6 0
Globe Tel. & Tel.:					
Ord.	8½*	8½*	80/–	..	—
Pref.	6	6	28/9	..	4 3 6
Great Northern Tel.:					
(£10)	20	20	14½	..	—
Inter. Tel. & Tel.	Nil	Nil	3	..	—
Marconi-Marine	7½	7½	27/6	..	5 9 1
Oriental Tel. Ord.	11½*	16	71/3	..	4 9 10
Telephone Props.	6	6	11/3	..	10 13 4
Tele. Rentals (5/-)	10	10	9/–	..	5 11 3
Traction and Transport					
Anglo. Arg. Trams:					
First Pref. (£5)	Nil	Nil	2/6	..	—
4% Inc.	Nil	Nil	7½	..	—
Brit. Elec. Traction:					
Def. Ord.	45	45	875	+10	5 2 10
Pref. Ord.	8	8	170	..	4 14 2
Bristol Trams	8*	8	42/6	..	3 15 4
Brazil Traction	$1	50c.	11¼	+¼	—
Calcutta Trams	8	5½	22/6	–¼	4 17 9
Cape Elec. Trams.	5	5	20/–	..	5 0 0
Lancs Transport	10	10	42/6	..	4 14 1
Mexican Light:					
1st Bonds	5	5	65	..	—
Rio 5% Bonds	5	5	91½	–3	5 9 3
Southern Rly.:					
5% Prefd.	5	5	61½	..	8 2 8
5% Pref.	5	5	100½	+1	4 19 6
T. Tilling	10	10	46/3	..	4 6 7
Tilling & B.A.	8*	7*	52/6	..	2 13 4
West Riding	10	10	39/–	..	5 2 7

(*Continued on next page*)

* Dividends are paid free of Income Tax.

Company	Dividend 1939–40	Dividend 1940–41	Middle Price Nov. 4	Rise or Fall	Yield p.c. £ s. d.
Equipment and Manufacturing					
Aron Elec. Ord. ..	Nil	7½	22/–	..	6 16 4
Assoc. Elec.:					
Ord.	10	10	43/9	..	4 16 3
Pref.	8	8	37/6	+⅛	4 5 4
Automatic Tel. & El.	12½	12½	48/9	..	5 2 6
Babcock & Wilcox	11	11	45/–	..	4 17 9
British Alumimium	12½	10	44/6	..	4 10 0
British Insul. Ord...	20	20	91/3	..	4 7 9
British Thermostat (5/–)	18½	18½	13/9	..	6 14 6
British Vac. Cleaner (5/–)	12½	10	12/6	..	4 0 0
Brush Ord... ..	Nil	Nil	4/6	..	—
Callender's ..	15	15	73/9	+⅛	4 1 4
Chloride Elec.Storage	15	15	70/–	..	4 5 9
Consolidated Signal	17	17	75/–	..	4 10 10
Crabtree (10/–) ..	17½	17½	28/9	..	6 1 9
Crompton Parkinson Ord. (5/–) ..	30	20	20/–	..	5 0 0
E. K. Cole (5/–) ..	10	Nil	8/–	+6d.	—
E.M.I. (10/–) ..	Nil	6	13/3	+1/–	4 10 7
Electric Construction	10½	10	32/6	..	6 3 0
Enfield Cable Ord.	16½	12½	53/9	..	4 13 0
Elecl. Switchgear (10/–)	16	10	20/–	..	5 0 0
English Electric ..	10	10	36/3	..	5 10 4
Ensign Lamps (5/–)	25	25	16/3	..	7 13 10
Ericsson Tel. (5/–)	25*	22*	40/–	..	2 15 0
Ever Ready (5/–) ..	40	40	29/–	..	6 18 0
Falk Stadelmann ..	7	7½	17/6	..	8 11 6
Ferranti Pref. ..	7	7	26/3	..	5 6 10
G.E.C.:					
Pref.	6½	6½	32/6	..	4 0 0
Ord	20	17½	77/6	..	4 10 2
Greenwood & Batley	15	13	25/–	..	10 8 0
Hall Telephone (10/–)	15	10	15/–	..	6 13 4
Henley's (5/–) ..	20	20	22/6	..	4 9 1
4½% Pref. ..	4½	4½	21/3	..	4 4 8
Hopkinsons ..	15	15	45/–	..	6 13 4
India-Rubber Pref.	5½	5½	21/3	..	5 3 6
Intl. Combustion ..	32½	30	105/–	..	5 14 3
J. Lucas	15	15	60/–	..	5 0 0
Johnson & Phillips	15	15	55/–	..	5 9 1
Lancashire Dynamo	20	20	62/6	..	6 8 0
Laurence, Scott (5/–)	15	15	11/–	..	6 16 4
London Elec. Wire	7½	7½	25/–	..	6 0 0
Mather & Platt ..	13½	10	42/6	..	4 14 1
Metropolitan Elec. Cable Pref. ..	5½	5½	21/3	..	5 3 6
Murex	20	20	90/–	+½	4 9 0
Pye Deferred (5/–)..	25	25	13/9	..	9 1 10
Revo (10/–) ..	5	20	25/–	..	8 0 0
Reyrolle	12½	12½	56/3	..	4 9 0
Siemens Ord. ..	7½	7½	25/–	..	6 0 0
Strand Elec. (5/–)..	4	2	3/–	..	3 6 8
S. Smith (4/–) ..	37½	50	7/–	..	7 2 10
Switchgear & Cowans (5/–) ..	10	15	10/–	..	7 10 0
Tel. Condenser (10/–)	Nil	5	11/3	..	4 9 0
T.C. & M.	10	10	41/3	..	4 17 0
Telephone Mfg. (5/–)	9	9	8/3	..	5 9 1
Tube Investments .	23¾	23¾	92/6	..	5 2 8
Vactric (5/–) ..	4	Nil	3/6	..	—
Vickers (10/–) ..	10	10	16/9	+3d.	5 19 5
Ward & Goldstone (5/–)	20	20	17/6	..	5 14 3
Westinghouse Brake	17½	10	47/6	..	4 4 4
Walsall Conduits (4/-)	55	55	31/3	..	7 0 9
West, Allen (5/–) ..	7½	7½	5/–	..	7 10 0

* Dividends are paid free of Income Tax.

Stocks and Shares (*Concluded from page 519*)

consulting technical adviser to Cable and Wireless, as from the end of last week. Baird Television shares are a nominal market at nothing to 3d. Transfers are not accepted by the company, but in due course the shares will become Cinema Television, leave to deal in whose shares has not yet been granted by the Stock Exchange Committee.

Marconi's

Marconi Marine shares are a firm market at 27s. 6d., on the announcement of an interim dividend of 2½ per cent., the same as that of twelve months ago. The final dividend of 5 per cent. brought up the total to 7½ per cent. for the year; a rate which it seems reasonable to anticipate will be continued. The parent company—Marconi's Wireless Telegraph—declares its usual 3½ per cent. interim dividend. For the latter half of 1940 a similar rate was paid, making 7 per cent. for the year. Marconi Marines are £1 shares: Marconi Wireless, 10s. shares. Of the latter, by far the greater part is held by Cable and Wireless, but there are a few Marconis still left in the hands of private proprietors and these occasionally dribble into the Stock Exchange market. The nominal price is about 12s. 6d. Before the war Italian investors took a mild interest in the shares, but it is hardly necessary to add that, nowadays, Italian transactions are no longer handled in our Stock Exchange.

India Rubber Preference

India Rubber, Gutta Percha & Telegraph Works 5½ per cent. preference shares are so well held that they rarely come to market in any worth-while number. During the last few days, however, a seller appeared of 1,000 at 22s. 3d., at which price the yield on the money is nearly 5 per cent. Dividends are due in March and September. The preference dividend is well covered, according to the reports of the past few years, previous to which the history of the concern had been somewhat checkered. The preference shares are now regarded as a sound industrial investment, and this modest line of shares complies with the modern requirement which regards a 5 per cent. yield on the money as being reasonable, when backed by good security.

NEW PATENTS

Electrical Specifications Recently Published

The numbers under which the specifications will be printed and abridged are given in parentheses. Copies of any specification (1s. each) can be obtained from the Patent Office, 25, Southampton Buildings, London, W.C.2.

1939

3834. "Mercury switch operated by changes in liquid level." C. E. Sleeper. February 6th, 1939. (540165.)

10998. "Gas-discharge tubes." W. O. Schumann. April 11th, 1938. (540126.)

21721. "Telecommunication exchange systems." Standard Telephones & Cables, Ltd., E. P. G. Wright and L. P. Lowry. July 26th, 1939. (540128.)

22918. "Photographic sound recording." A. Laffon y Soto, and E. de Selgas y Marin. August 16th, 1938. (540205.)

1940

3872. "Electro-mechanical wave filters." Standard Telephones & Cables, Ltd. March 8th, 1939. (540171.)

4029. "Electrical protective systems." General Electric Co., Ltd., and W. Wilson. March 4th, 1940. (540172.)

4235. "Electric fuses of cartridge type." Electric Transmission, Ltd., R. G. Andersen, I. E. Humphreys and K. Dannenberg. March 6th, 1940. (540130.)

4391. "Fans particularly for use in drying apparatus." H. J. Hoare. March 8th, 1940. (540244.)

5865. "Refrigerating cabinet provided with a compressor refrigerating machine driven by an electric motor." Patentverwertungs-Ges. Hermes. March 31st, 1939. (540293.)

6040. "Luminous electric tubes and holders therefor." Naamlooze Vennootschap Philips' Gloeilampenfabrieken. April 6th, 1939. (540217.)

6051. "Modulation systems for radio and like transmitters." Marconi's Wireless Telegraph Co., Ltd., and T. H. Price. April 3rd, 1940. (Cognate application, 12752/40.) (540245.)

6053. "Electronic relay circuit arrangements." Marconi's Wireless Telegraph Co., Ltd., N. E. Davis, N. H. Clough and L. Bounds. April 3rd, 1940. (540218.)

6073. "Telephone systems." Automatic Telephone & Electric Co., Ltd., F. E. Comyn and E. Frydman. April 4th, 1940. (540132.)

6128. "Differential gear mechanism." Marconi's Wireless Telegraph Co., Ltd., and N. H. Clough. April 4th, 1940. (540222.)

6150. "Fuse boxes and like distribution board boxes for electrical installations." V. Hope. April 5th, 1940. (540141.)

6174. "Mechanical amplifiers for telephone subsets." Standard Telephones & Cables, Ltd., and F. Fairley. April 5th, 1940. (540179.)

6184. "Electric condensers." Dubilier Condenser Co. (1925), Ltd. April 5th, 1939. (540144.)

6194. "Measuring, registering and indicating devices." E. Windsor-Bowen. April 5th, 1940. (540146.)

6244. "Radiant heaters." Radiant Heating, Ltd., and A. Docking. April 6th, 1940. (540223.)

6275. "Means for obtaining a control effect from a gyroscope." Automatic Telephone & Electric Co., Ltd., and L. M. Simpson. April 8th, 1940. (540224.)

6390. "Telecommunication exchange systems." Standard Telephones & Cables, Ltd., and E. P. G. Wright. April 9th, 1940. (540250.)

6408. "Contacts associated with electric batteries." Ceag, Ltd., and R. J. Plummer. April 9th, 1940. (540181.)

6430. "Fluorescent materials." F. F. Renwick and H. S. Tasker. April 9th, 1940. (540252.)

6431. "Fluorescent material." H. S. Tasker. April 9th, 1940. (540253.)

6471. "Methods of filling confined spaces associated with electric apparatus." Standard Telephones & Cables, Ltd., and E. C. Lee. April 10th, 1940. (540300.)

6506. "Shunt AC commutator motors." B. Schwarz (Schorch-Werke Akt.-Ges.) April 10th, 1940. (540151.)

7093. "Electrical high-frequency wave-transmission systems." Standard Telephones & Cables, Ltd. April 19th, 1939. (540232.)

7239. "Electric switches of the rotary distributing type." Edison Swan Electric Co., Ltd., and E. W. Norman. April 22nd, 1940. (540258.)

7445. "Refrigerating machines." British Thomson-Houston Co., Ltd. April 25th, 1939. (540260.)

8188. "Electrical signalling systems." Standard Telephones & Cables, Ltd. May 19th, 1939. (540233.)

8353. "Electrical water heaters." A. R. Shepherd. May 9th, 1940. (540265.)

8592. "Apparatus actuated by or controlling fluid under pressure." English Electric Co., Ltd., A. R. Blandford and F. G. Rowland. May 13th, 1940. (540321.)

9715. "Electric conduit systems, and unit components therefor." L. G. Morten and J. F. O'Brien. July 27th, 1939. (540157.)

9972. "Piezo-electric crystal apparatus." Standard Telephones & Cables, Ltd. (Western Electric Co., Inc.) June 7th, 1940. (Convention date not granted.) (540184.)

9973. "Ultra-short-wave radio systems." Standard Telephones & Cables, Ltd. June 8th, 1939. (540159.)

9975. "System of transmission of electrical waves." Standard Telephones & Cables, Ltd. June 30th, 1939. (540185.)

10345. "Valves." British Thomson-Houston Co., Ltd. June 16th, 1939. (540186.)

10445. "Electric communication systems." Siemens Bros. & Co., Ltd., and A. Rosen. June 17th, 1940. (540187.)

10898. "Projection of kinematograph films in colour." British Thomson-Houston Co., Ltd., and A. Bowen. June 26th, 1940. (540272.)

10941. "Reflectors of electric lamp fittings." Veritys, Ltd., and J. W. Forth. June 27th, 1940. (540189.)

10942/10943. "Means for periodically interrupting electric currents." J. A. Crabtree & Co., Ltd., and H. F. McLoughlin. June 27th, 1940. (540273/540274.)

11163. "Thermally operated release means, applicable to electric switches." L. V. Turner. (F. A. Talbot.) July 2nd, 1940. (540237.)

11759. "Electric amplifying systems." Standard Telephones & Cables, Ltd. July 18th, 1939. (540193.)

12043. "Thermal release devices for electric switches." J. A. Crabtree & Co., Ltd., and H. F. McLoughlin. July 23rd, 1940. (540197.)

12331. "Synthetic resinous compositions." British Thomson-Houston Co., Ltd. August 2nd, 1939. (540198.)

12468. "Dynamo-electric machines." British Thomson-Houston Co., Ltd. August 1st, 1939. (540199.)

12751. "Cooling arrangements for thermionic valves." Marconi's Wireless Telegraph Co., Ltd., and A. J. Young. August 8th, 1940. (540240.)

12866. "Electric cable clamps." J. A. Crabtree & Co.. Ltd., H. F. McLoughlin and W. E. Hill. August 12th, 1940. (540162.)

12886. "Automatic telephone systems." Siemens Bros. & Co., Ltd., D. A. Christian and B. A. Hensler. August 12th, 1940. (540201.)

13486. "Method of making insulated wire of small or non-circular cross-section." British Thomson-Houston Co., Ltd. August 25th, 1939. (540203.)

13695. "Television." Marconi's Wireless Telegraph Co., Ltd. August 31st, 1939. (540281.)

CONTRACT INFORMATION

Accepted Tenders and Prospective Electrical Work

Contracts Open

Where "Contracts Open" are advertised in our "Official Notices" section the date of the issue is given in parentheses.

Australia.—SYDNEY COUNTY COUNCIL.—November 27th. Two 30,000-kVA transformers for Bunnerong. Specification 544.

Belfast.—November 24th. Electricity Department. Arc rectifier, A.C. motors and wiring, 6.6-kW switchgear, 33-kV cables and static transformer. (October 31st.)

Birkenhead.—November 17th. Electricity Department. Stores for six months commencing January 1st, 1942. (See this issue.)

Edinburgh.—November 14th. Electricity Department. Insulated cables to specification No. 186 for period December 1st, 1941, to November 30th, 1942. Forms, etc., from the engineer and manager, Dewar Place; tenders to town clerk.

Sleaford.—November 17th. Electricity Department. 150-kVA, three-phase transformer. (October 24th.)

South Africa.—POST OFFICE.—December 4th. Equipment for radio-telephone link between Maseru and Mokhotlong. (October 24th.)

DURBAN. — November 28th. City Council. Tap-changing transformer, etc.

Orders Placed

Barrow-in-Furness.—Electricity Committee. Accepted. Multicore cable (£1,049).—British Insulated Cables, Ltd.

Birkenhead.—Electricity Committee. Accepted. Voltage regulator (£138).—Ferranti, Ltd. Contract extensions recommended for six months:—Paper insulated cables: Aberdare Cables, Ltd.; Scottish Cables, Ltd.; Britannic Electric Cable & Construction Co., Ltd. Rubber-insulated cable: Durham Cables, Ltd.; William Geipel, Ltd.; Mersey Cable Works, Ltd. Meters: British Electric Meters, Ltd.; Ferranti, Ltd.; Landis & Gyr, Ltd.; Measurement, Ltd.; Sangamo Weston, Ltd.; Smith Meters, Ltd.; Venner Time Switches, Ltd.

Dartford.—Electricity Committee. Recommended. Rewinding transformer (£85).—Hackbridge Electric Transformer Co., Ltd.

Glasgow.—Corporation Transport Committee. Accepted. Electrical canteen equipment.—English Electric Co., Ltd.

India.—CHIEF CONTROLLER OF STORES.—Accepted. Copper conductor (Rs. 4,606), silk-covered enamelled copper wire (Rs. 1,600) and submarine telegraph cable (Rs .20,059).—W. T. Henley's Telegraph Works Co. Stay rods (Rs. 2,282).—Callender's. Porcelain insulators (Rs.3,88,167).—Bengal Potteries, Ltd. (Rs.92,625). —M. L. Sinha & Co. (Calcutta). Solid h.d. copperweld wire (Rs. 3,86,760).—Indian Cable Co.

Liverpool.—Electric Power and Lighting Committee. Accepted. One 2,000-kVA transformer (£798).—Yorkshire Electric Transformer Co., Ltd. Two 11,000-V neutral earthing switches (£206).—Metropolitan-Vickers Electrical Co., Ltd.

London.—ST. PANCRAS. Contracts Committee. Accepted. Renewed contract for cables.—Standard Telephones & Cables, Ltd.

Contracts in Prospect

Particulars of new works and building schemes for the use of electrical installation contractors and traders. Publication in this section is no guarantee that electrical work is definitely included. Alleged inaccuracies should be reported to the Editors.

Barnsley.—Concentrator plant for kitchen waste; H. Taylor, borough surveyor, Town Hall.

Bideford. — British Restaurant at Pannier Market; borough engineer.

Birkenhead.—Adaptation of Arrowe Hall for use as annexe to Municipal Hospital; E. W. Tame, town clerk, Town Hall.

Boldon (Co. Durham).—Restaurant at the Co-operative Hall for the U.D.C. (£535); N. Hindmarsh, surveyor.

Brighouse.—Conversion of New Road Sunday Schools, Rastrick, into British Restaurant (£3,250); H. A. Sneezum, borough surveyor, Municipal Buildings, Brighouse.

Bristol.—Police station, Knowle and Bedminster estate; city engineer, 63, Queen Street.

Cheltenham.—Works at the Winter Garden (£4,233); T. Overbury, architect.

Cheshire.—Completion of partially erected boys' school, Sale, and feeding centre at Marple; county architect, The Castle, Chester.

Chesterfield.—Works extensions; J. Thompson (Sheffield) Limited, saw makers.
Canteen extensions at works; Bryan Donkin, Ltd., Derby Road, Chesterfield.

Clayton.—Day Nursery, Ashton New Road and North Road, for Manchester Public Health Committee; G. Noel Hill, city architect, Town Hall, Manchester.

Croydon.—Rest centre, Waddon; E. Taberner, town clerk, Town Hall.

Dudley.—Garages for highway depots; borough engineer, Council House.

Dunfermline.—Adaptation of premises as communal restaurant (kitchen equipment) to cost £2,000; burgh surveyor.

Edmonton.—Factory premises; Aerators, Ltd.

Eston.—Shelters (£48,000); Surveyor to the U.D.C.

Farnham.—Central kitchen for 1,400 children; Surrey county architect, Kingston-on-Thames.

Golborne.—Houses and flats, Culcheth; surveyor, Council Offices, Newton Road, Lowton, Leigh, Lancs.

Halifax.—Conversion of old hospital, Stony Royd, into flats; D. T. Lloyd Jones, borough engineer, Crossley Street.

Hereford.—Additions to offices, Edgar Street; Bonner & Sons.
Canteen alterations, Mortimer Road works, for Painter Bros., Ltd.; Nicholson & Scriven, architects, Cathedral Chambers, King Street.

Ilford.—Depot extensions (£2,804); E. J. Robinson, Ltd.
Bakery extension, 119, Woodlands Road, for Ideal Bakeries ; B. Bailey & Co.

Keighley.—Offices; Bolivar Stamping Co.
Additions, Bradford Road; A. Fielding & Co.

Kidderminster.—Water scheme; borough surveyor, Mill Street.

Kilmarnock.—Accommodation at first-aid post comprising shelter type building, etc.; burgh surveyor.
Additional school classrooms in North Hamilton Street, for County Council (£1,600); county architect, Ayr.

London.—FULHAM.—Day nursery, Eridge House (£550); borough engineer.
WESTMINSTER.—Shelters, etc. (£48,000); city engineer.

Macclesfield.—Brick and concrete shelters and improvements to existing shelters (£14,000); M. Tetlow, borough architect, Pear Tree House, Jordangate.

Manchester.—Canteen and works alterations for S. Marsden & Sons, Ltd.; L. Brown & Sons, Ltd., building contractors, Wilmslow, Ches.

Middlesbrough.—Additions for the Lionweld Flooring & Stairway Co., Ltd.

Morley.—Additions; Harry Hardy, Ltd.
Offices extensions, Commercial Street; Morley Trades and Labour Council.
Additions, Moorhead Mills; H. Booth & Sons.

Reading.—Buildings suitable for laundries on Whitley estate and at Tilehurst; borough engineer, Town Hall.

St. Albans.—Houses, Napsbury estate, London Colney; E. Stevens, builder, New Barnes Avenue, St. Albans.

Salop. —Kitchen at Wrockwardine Wood School, and adaptation and equipment of The Row, Wellington, as dining-room and canteen; county architect, 5, Belmont, Shrewsbury.

Staveley.—Houses; J. B. McGaw, surveyor, Council Offices.

Swinton and Pendlebury.—Electrical installations in shelters; H. C. Busbridge, borough electrical engineer, Town Hall, Swinton.

Taunton.—Rebuilding of county and divisional headquarters, for Somerset Standing Joint Committee; county architect, Park Street, Taunton.

Welton.—Building to house new water softening plant, etc., for R.D.C.; Elliott & Brown, engineers, Stanley House, Pelham Road, Nottingham.

Wembley.—Waste food concentrating plant house; borough treasurer, Town Hall, Wembley, Middlesex.

Wolverhampton. —Extensions; Cleland & Hayward.
Factory additions; Marcus Brown & Lewis.

Yorkshire.—Conversion of Otley Institution as county hospital; West Riding county architect, Wakefield.

Engineering Education

UNIVERSITY engineering education, which had been his primary preoccupation for the past 40 years, was the subject chosen by Professor C. E. Inglis for his presidential address in London on November 4th to the INSTITUTION OF CIVIL ENGINEERS, which had not had an educationalist president since Dr. Unwin in 1911.

Education rather than specialised training should be the university ideal, the professor pointed out, strongly emphasising how much more profound education was than mere instruction. He opposed premature specialisation, considering that the primary duty of universities was to cater for future needs, meaning men destined to hold civilian positions of great and varied responsibilities.

His plea was for the leavening of engineering education with some small measure of the humanities, for concentration on materialistic and scientific aspects of the profession tended to produce a certain narrowness of vision. Mathematics must occupy a prominent position in any engineering course, but it was nothing more than a means to an end, which was the solving of engineering problems. There was no doubt that education, particularly in Great Britain, suffered from a surfeit of examinations. It was easy to condemn the system, but even its most bitter critics had no clear cut alternative to suggest.

THE
ELECTRICAL REVIEW

Volume CXXIX **No. 3338**

Friday, November 14, 1941

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EDITORIAL, ADVERTISING AND PUBLISHING OFFICES: Dorset House, Stamford Street, London, S.E.1

Telegraphic Address: "Ageekay, Sedist, London." Code: A B C. Telephone No.: Waterloo 3333 (35 lines)

Registered at G.P.O. as a Newspaper and Canadian Magazine rate of postage. Entered as Second Class Matter at the New York, U.S.A., Post Office.

Subscription Rates, Postage free: United Kingdom, £1 14s. 8d.; Canada, £1 12s. 6d.; Colonial and Foreign, £1 14s. 8d. per annum.

Cheques and Postal Orders (on Chief Office, London) to be made payable to ELECTRICAL REVIEW LTD., and crossed "Lloyds Bank"

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These two folders give concise technical data of more than 120 electrical instruments, and form handy reference sheets.

Folder 53-x describes D.C. instruments.
Folder 54-x describes A.C. Instruments.

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